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AUTOMOTIVE INDUSTRIES

A CHILTON PUBLICATION

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MATERIAL RECORD

JANUARY 1, 1960

Features • • •

INSIDE THE AMA

MACHINE TOOL OUTLOOK BRIGHT

NEW HORIZONS IN METAL FINISHING

PRODUCTION AT SKODA PLANT

AUTOMOTIVE USES FOR DUCTILE IRON

AMA Show Committee
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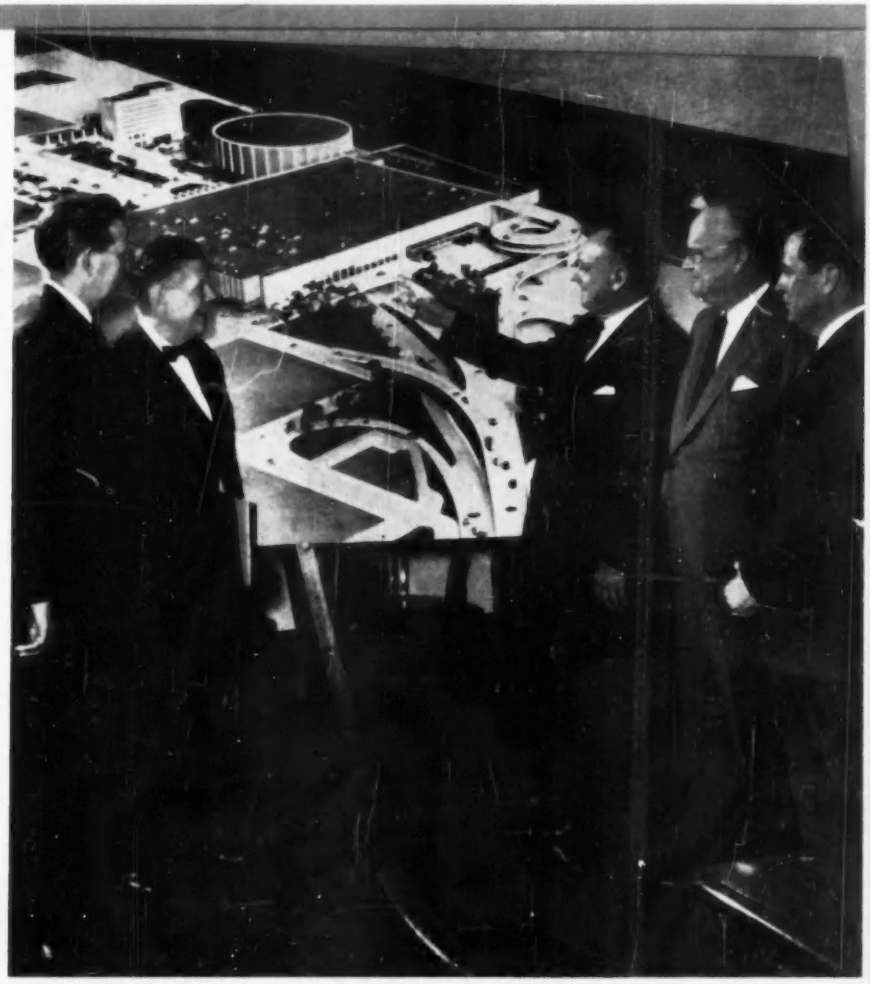
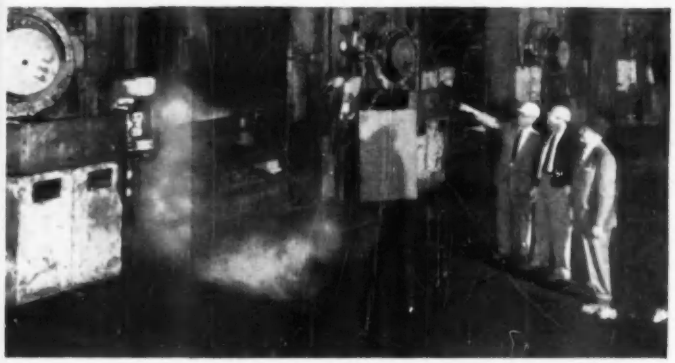


Left to right are — Howard A. Hallas, Charles F. Moore, Jr., Charles L. Jacobson, William F. Hufstader, and Harry A. Williams

ENGINEERING
MANAGEMENT • • PRODUCTION
DESIGN

PERFORMANCE REPORT



R. J. Huff, Granite City maintenance superintendent, points out Morgoil bearings to J. H. Koester, Granite City lubrication engineer, and W. P. "Sandy" Wehking of Standard Oil.

How *STANOIL Industrial Oil has been delivering on 22-year assignment at Granite City Steel*

Situation: In 1937, Granite City Steel installed STANOIL Industrial Oil in the Morgoil Back-up Roll Bearings in the five-stand finishing train of their hot strip mill. Each bearing has a load-carrying capacity of more than three million pounds. The oil on which these bearings ride must be of high quality to meet the requirements of this severe service. A narrow viscosity range is required to assure proper operation of the mill throughout the speed range. More than 10,000 gallons of water per minute cool the work rolls. The oil thus must have superior demulsibility to prevent water contamination.

What has happened: Today approximately 1,800 tons rolled is the average shift production. A record of over 2,700 tons rolled has been racked up by one shift in this mill. STANOIL Industrial Oil has continued to deliver top operating performance under these increasingly demanding conditions. Samples of the oil are taken regularly by the Standard Oil lubrication specialist for laboratory analysis to make sure the oil is maintaining specifications. Stocks of STANOIL Industrial Oil are warehoused by Standard at East St. Louis, only twelve miles away, so that the mill has a ready source for the product whenever needed.

What you can do: Get all the facts about STANOIL Industrial Oil from the Standard Oil lubrication specialist near you in any of the 15 Midwest or Rocky Mountain states. Or write **Standard Oil Company (Indiana), 910 South Michigan Avenue, Chicago 80, Ill.**

STANDARD

You expect more from Standard and you get it!

Bearing assembly viewed from inside by J. H. Koester and Sandy Wehking. Sandy Wehking knows industrial lubrication. For 17 years he's been providing lubrication technical service to industrial customers. He studied chemistry at Blackburn College and has completed the Standard Oil Sales Engineering School.

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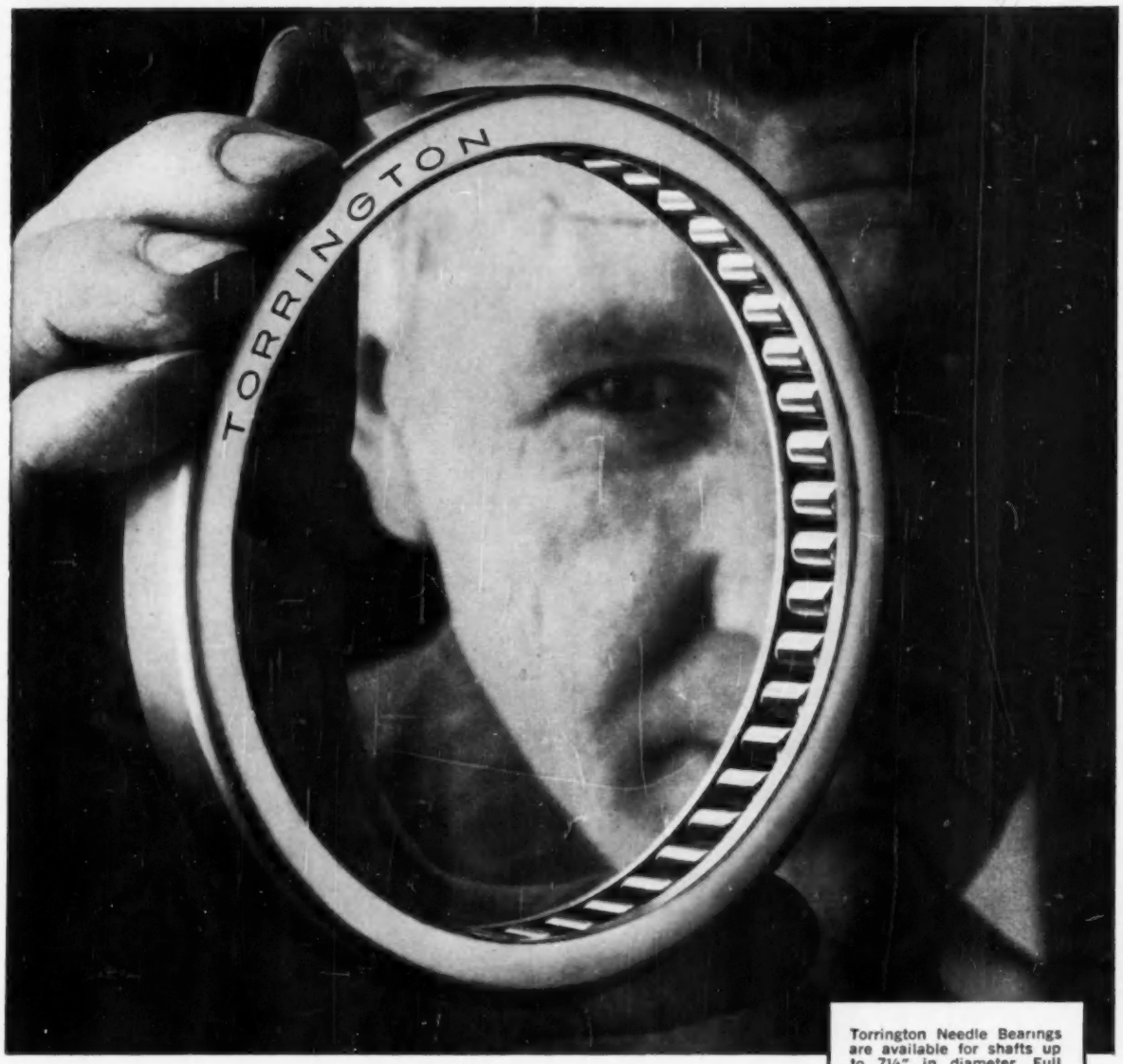

Torrington Needle Bearings are available for shafts up to 7¼" in diameter. Full complement of rollers provides highest radial capacity for a given cross section. They offer low unit cost, compactness and light weight and long service life. They take a press fit in a simple straight-bore housing, run directly on hardened shafts, permitting use of larger and stiffer shafts.

Why not put a Torrington Needle Bearing on that large shaft?

You have everything to gain by applying a large diameter Torrington Needle Bearing in your heavy duty applications.

There's the unusual economy in price and installation cost over other anti-friction bearings of comparable size. Simplicity of design of related components saves even more. Unequaled capacity for a given cross section, good lubrication and efficient anti-friction operation mean long service life.

These advantages have been proved in performance in tractor bolsters, transmissions and final drives. In haybaler crank shafts. In power shovels. In heavy duty hydraulic pumps and starting motors. In road wheel arms on tanks. Why not talk over *your* application with your Torrington representative? **The Torrington Company, Torrington, Conn.—and South Bend 21, Ind.**

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Acids, Beverages, Caustics, Dyes... everything goes in Stainless Steel tankers

Cleanability of corrosion-resisting type 316 Stainless Steel gives tank trailers great hauling flexibility

Leave the home lot in the morning loaded with animal or vegetable oils, return in the evening with paint or varnish, and back on the road before daylight with a load of glue . . .

This is the kind of flexibility you can build into a tank trailer when you use type 316 Stainless Steel.

Its lasting resistance to corrosion means that many liquids–chemicals, foods, petroleum products – can be bulk transported in the same tanker. Usually, all that's needed to change from one product to another is a quick, but thorough, cleaning job.

The corrosion-resisting quality of type 316 Stainless also boosts *the service life* of the tanker. One motor transport company reports that they bought their first stainless steel tanker 20 years ago and *it's still in service.*

Easy to fabricate... economical to produce

The nickel content of 316 Stainless Steel not only enhances the metal's corrosion resistance and durability, but also gives it unusual ductility and weldability . . . makes possible fast, simple fabrication . . . economical production.

If you would like more information about the superior corrosion resistance and fabricability of 316 Stainless Steel . . . as well as the specific properties and characteristics, just let us know. We'll answer any specific questions you have.

The INTERNATIONAL NICKEL COMPANY, Inc.
67 Wall Street INCO New York 5, N. Y.

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AUTOMOTIVE INDUSTRIES

A CHILTON MAGAZINE - PUBLISHED SEMI-MONTHLY

JANUARY 1, 1960

Passenger Cars • Trucks • Buses • Aircraft • Tractors • Engines • Bodies • Trailers • Road Machinery • Farm Machinery • Parts and Components • Accessories • Production and Processing Equipment • Design • Production • Engineering • Management

VOL. 122 No. 1

Features . . .

Inside the AMA

In broad terms, the AMA represents the cooperative side of one of the most competitive industries in the world. In this issue there is presented, in one comprehensive article, the "inside" story which tells how members of this dynamic industry work together and also cooperate with representatives of other industries. An organizational chart lists officers and members of major standing AMA committees. Page 33

Machine Tool Outlook is Bright

With order backlogs averaging an increase of 96 per cent over a year ago, and prospects for 1st Half 1960 favorable for still further advances, the machine tool builders look with optimism on the threshold of the New Year. An evaluation of the situation, based on a survey conducted by AI editors, is presented in this issue. Page 43

New Horizons in Metal Finishing

Now it is possible to clean, phosphatize, and paint continuously in a single medium of trichlorethylene. Chevrolet is doing so at its Tonawanda (N. Y.) plant and has slashed finishing time on many steel parts for the 1960 Convair engine by 50 per cent. The unique three-stage system, developed by Du Pont Co., is incorporated in a single 65-ft hooded and conveyorized unit. Page 46

Ductile Iron

A comprehensive article covers the present and promising future applications of ductile iron components in the automotive industry. Included is a 23-item list of present ductile iron components for motor vehicles and a 13-item list of potential parts. Page 50

Aircraft Hydraulic Conference

At the ninth renewal of the aircraft hydraulic conference sponsored by Vickers, Inc., many prominent figures in the field discussed current hydraulic applications to the latest planes. Also covered were the future potentials of hydraulic aircraft components. Joseph Geschelin describes this meeting in an interesting article. Page 52

Skoda Automobile Plant Boosts Production

Czechoslovakia has embarked on a vast expansion program aimed at raising annual production of passenger cars from the present level of 50,000 cars to 400,000 in the next decade. Expansion of the Skoda factory at Mlada Boleslav is expected to increase output to 500 units per day. The plant is described by David Scott in a well-illustrated article. Page 60

13 New Product Items, And Other Features, Such As:

Air Briefs, and Industry Statistics.

. . . continued on next page

Cover Illustration

Five members of the Show Committee of the Automobile Manufacturers Association, left to right—Howard A. Hallas, public relations director, American Motors Corp.; Charles F. Moore, Jr., vice president advertising and public relations, Ford Motor Co.; Charles L. Jacobson, vice president dealer relations, Chrysler Corp. (chairman of AMA Show Committee); William F. Hufstader, vice president in charge of distribution, General Motors Corp.; and Harry A. Williams, managing director, Automobile Manufacturers Association.

MEMBER

SBME Society of Business Magazine Editors

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NBP National Business Publications, Inc.

BPA Business Publications Audit of Circulation

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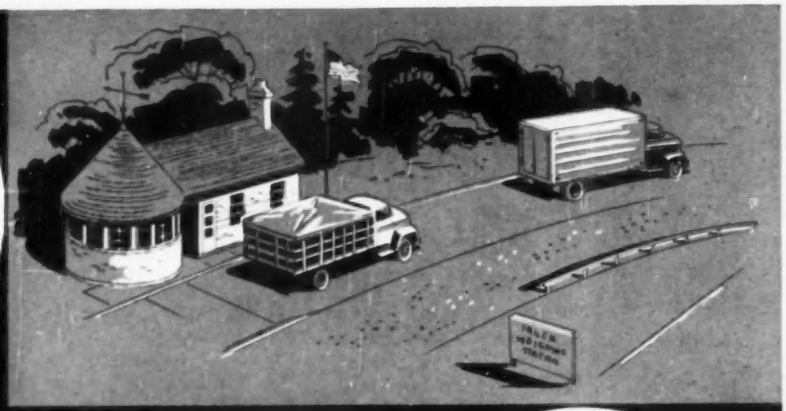
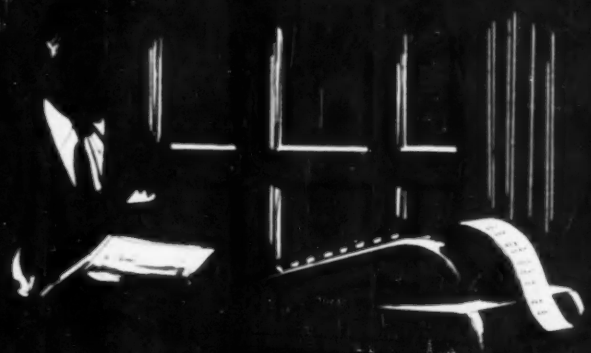




PRICE

Hydrovac Power Brakes cost less to buy—cost less to maintain.

PROTECTION

Hydrovac Power Brakes provide maximum dependability with built-in safety standby of manual braking in case of power failure.

MAKE BENDIX HYDROVAC THE MOST POPULAR POWER BRAKE WITH TRUCKERS

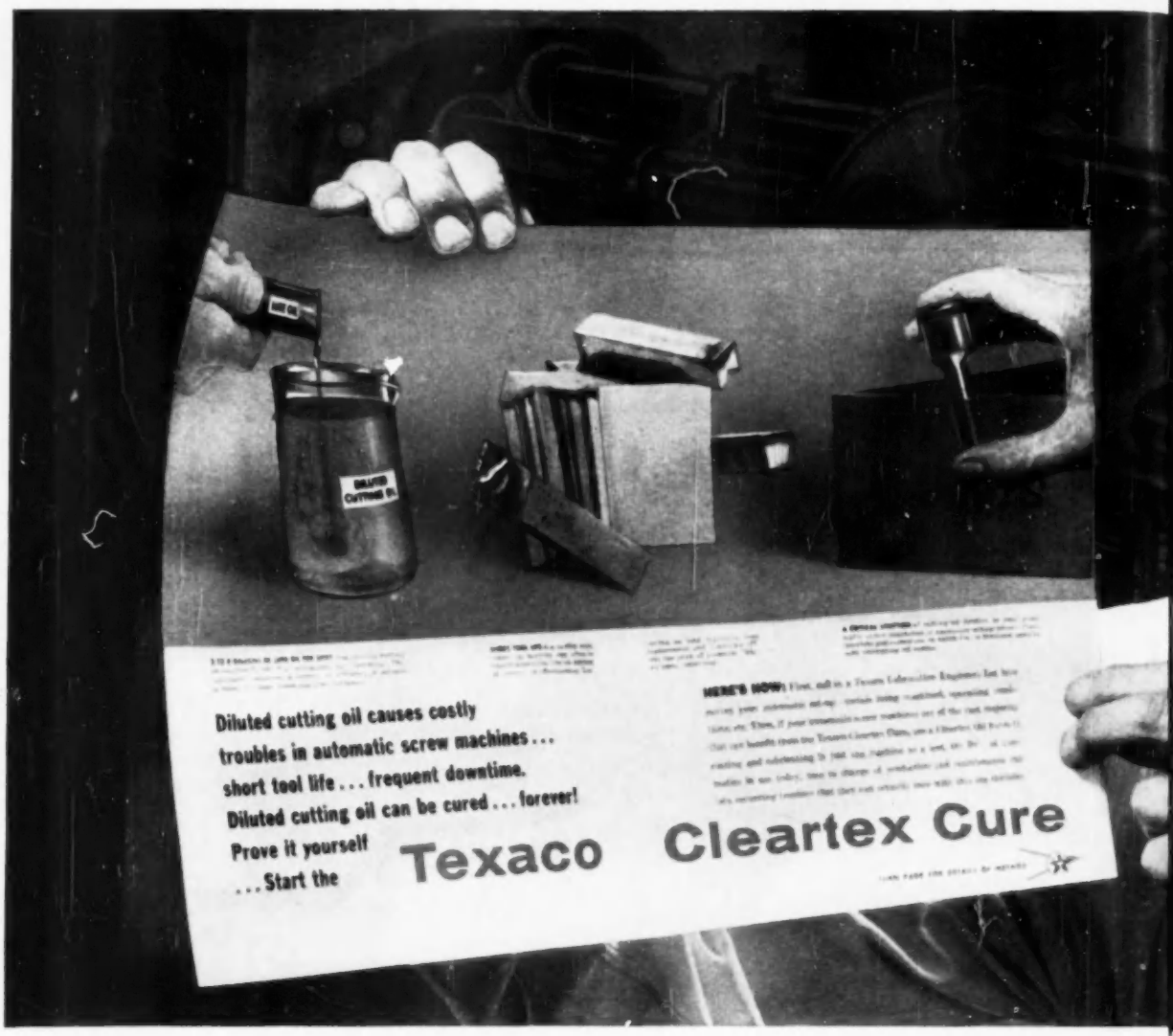
It's not just chance that makes Bendix Hydrovac the world's most popular power brake. Cost-conscious truckers all over the globe have recognized the superiority of vacuum power brakes and endorsed this superiority by specifying Bendix Hydrovac when they buy. Whether you build, buy, sell or operate trucks, you'll find it pays to ask for Bendix Hydrovac when ordering new equipment.

*REG. U.S. PAT. OFF.

More Bendix Hydrovac vacuum power brakes are in use than all other makes

Bendix PRODUCTS DIVISION South Bend, IND.

Bendix AVIATION CORPORATION



Over 400 automatic screw reduced costs in 1959

THIS IS WHAT WE PROMISED THE CLEARTEX CURE WOULD DO, JUST TWELVE MONTHS AGO:

- increase production by ⅓ from 7 out of 10 automatics
- end wasteful dilution of cutting oil forever
- sharply reduce the number of rejects
- extend tool life—and reduce tool regrinds, tool replacements, and downtime.

Now—here's proof: In 1959, the more than 400 automatic screw machine plants mentioned put Cleartex Oil in on test. All are now regular Cleartex users—enjoying the extra production and cost savings we promised.

Why don't you get the benefits of the Cleartex Cure? Here's all you have to do: 1) Send for Texaco's free booklet which tells you how the Cleartex Cure works. 2) Ask Texaco to send one of its Metalworking Engineers to your plant. He'll survey your automatic set-up and tell you which machines will benefit from Cleartex Oils. He'll also, if you wish, set up a test on one machine to show you how the Cleartex Cure can save money. He'll even demonstrate the Cleartex Cure on an entire line of machines if you want immediate savings. For fast action,

CLEARTEX is a tri-purpose oil for automatic screw machines that acts as a cutting oil and a lubricant and, if necessary, as a hydraulic fluid as well. This Cleartex advertisement, printed last year, shows how Cleartex ends cutting oil dilution, extends tool life, reduces rejects.

machine plants by acting on this ad!

just mail the coupon. Texaco Inc., 135 East 42nd Street, New York 17, N. Y.

Tune In: Texaco Huntley-Brinkley Report, Mon. Through Fri.-NBC-TV

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DEPT. AI-40
135 E. 42nd ST., NEW YORK 17, N. Y.

☐ Please send me your free descriptive booklet on the Cleartex Cure.

☐ Please ask a Texaco Metalworking Engineer to arrange for a survey on my plant.

Name_____

Title_____

Company_____

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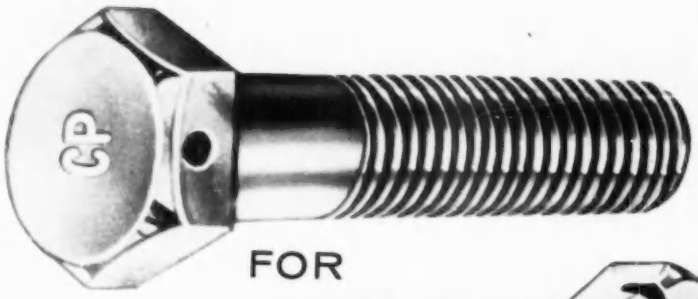

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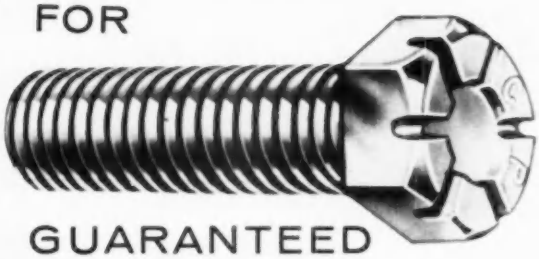

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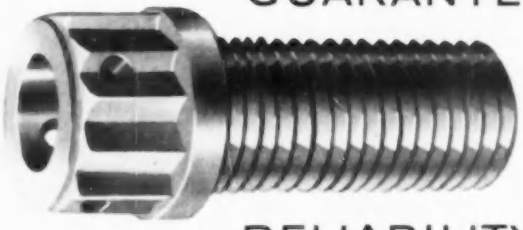

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CALENDAR

OF COMING SHOWS AND MEETINGS

SAE Annual Meeting, Sheraton-Cadillac and Statler Hotels, Detroit, Mich. ..... Jan. 11-15

Society of Plastic Engineers, 16th National ANTEC Meeting, Conrad Hilton Hotel, Chicago, Ill. Jan. 12-16

AIME Annual Meeting, Statler-Hilton and McAlpin Hotels, New York, N. Y. ..... Jan. 14-18

National Motor Boat Show, Coliseum, New York, N. Y. ..... Jan. 15-24

Chicago Automoblie Show, International Amphitheatre, Chicago, Ill. ..... Jan. 16-24

Industrial Heating Equipment Association, annual winter meeting, Warwick Hotel, Phila., Pa. Jan. 18-19

Plant Maintenance & Engineering Show, Convention Hall, Philadelphia, Pa. ..... Jan. 25-28

AAMA Exposition, Navy Pier, Chicago, Ill. ..... Jan. 25-28

Institute of the Aeronautical Sciences, Hotel Astor, New York, N. Y. ..... Jan. 25-28

Society of Vacuum Coaters, annual meeting, Hotel Biltmore, New York, N. Y. ..... Jan. 26-27

Private Truck Council of America, annual convention, Roosevelt Hotel, New York, N. Y. ... Jan. 28-29

NADA Annual Convention and Exhibition, Washington, D. C. Jan. 30-Feb. 3

ISA Instrument-Automation Conference and Exhibit, Coliseum, Houston, Tex. ..... Feb. 1-5

SPI Reinforced Plastics Div. Conference, Edgewater Beach Hotel, Chicago, Ill. ..... Feb. 2-4

Midwest Welding Conference, Illinois Tech Chemistry Bldg., Chicago, Ill. ..... Feb. 3-4

ASIA National Convention, Carnegie Hall, New York, N. Y. Feb. 8-9

IASI International Show, The Coliseum, New York, N. Y. ..... Feb. 10-13

Autorama, Hartford, Conn. ... Feb. 17-22

ASME Gas Turbine Power and Hydraulic Conference, Rice Hotel, Houston, Tex. ..... March 6-9

Material Handling Institute, spring meeting, Pittsburgh-Hilton Hotel, Pittsburgh, Pa. ..... March 29

American Power Conference, Hotel Sherman, Chicago, Ill. .... Mar. 29-31

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NOW Bullard DYNATROL*
FIRST fully Power-Controlled V.T.L.

Dynatrol* V.T.L. has Bullard's new Dynamic Precision Control . . . a fully powered machine tool control system which pays off in greater production.

Dynamic Precision Control keeps the tool in the cut more of the time . . . cuts time between cuts . . . increases the operating speed and output of the machine.

Dynatrol provides **infinitely variable feed rates** throughout the full range and **variable traverse rates** from zero to nine feet per minute. Feed rates may be advanced or retarded while the machine is cutting to obtain maximum tool performance and productivity.

Nine sizes from 26" to 124" table diameter.

Send to The Bullard Company, Bridgeport 9, Connecticut, for detailed catalog. Telephone EDison 6-2511.

*Trademark

* The control center of the New Bullard Dynatrol V.T.L. provides single lever control for all motions of each head. Feed rates — infinitely variable from zero to maximum — are directly geared to table rpm. A simple pendant controls start, stop and speed of table. Equally simple remote controls are available for machines of all sizes.

High-Spot Features of the DYNATROL® V.T.L.

Dynatrol V.T.L. is POWER CONTROLLED

By lever or pendant — it's your choice — head traverse rates can be varied from zero to nine feet per minute. Easy-to-read dials show exact position.

Feed selector gives infinitely variable feed rate without interrupting the cut.

Dynatrol V.T.L. is VERSATILE

Available equipment includes:

Bullard variable speed drive for infinitely variable table speeds throughout the full range with no loss of usable horsepower.

Fully automatic operation by Bullard Man-Au-Trol or point-to-point or continuous path numerical control systems.

Unique Size-Au-Trol® for accurate positioning of all heads. Contouring attachments: Hydraulic, electronic or electro-hydraulic. Four- or five-sided power-indexing turret heads. Thread cutting, drum scoring and angle turning attachment. Power-operated chucks.

Dynatrol V.T.L. is COMPACT

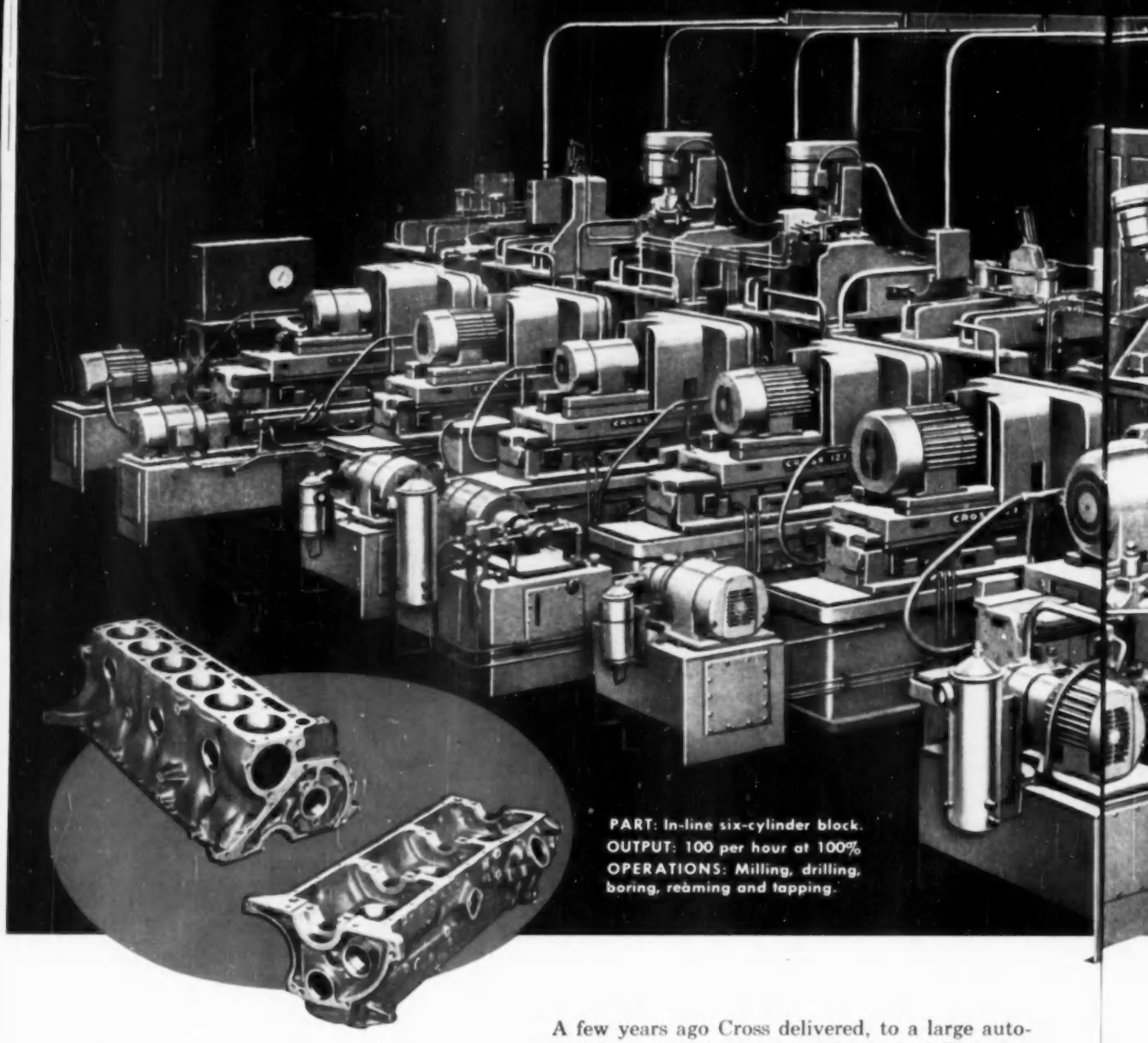
The new Bullard Dynatrol V.T.L. is compact in design, rigid in construction, lower in height, reduced in floor area.

Dynatrol V.T.L. is EASY TO MAINTAIN

Automatic lubrication throughout... fewer parts... fewer adjustments... easily accessible.

BULLARD "YOU CAN'T BEAT A BULLARD"

Six-Cylinder Engines Now Processed on Cross Transfer-matics That Made V-8's a Few Months Ago



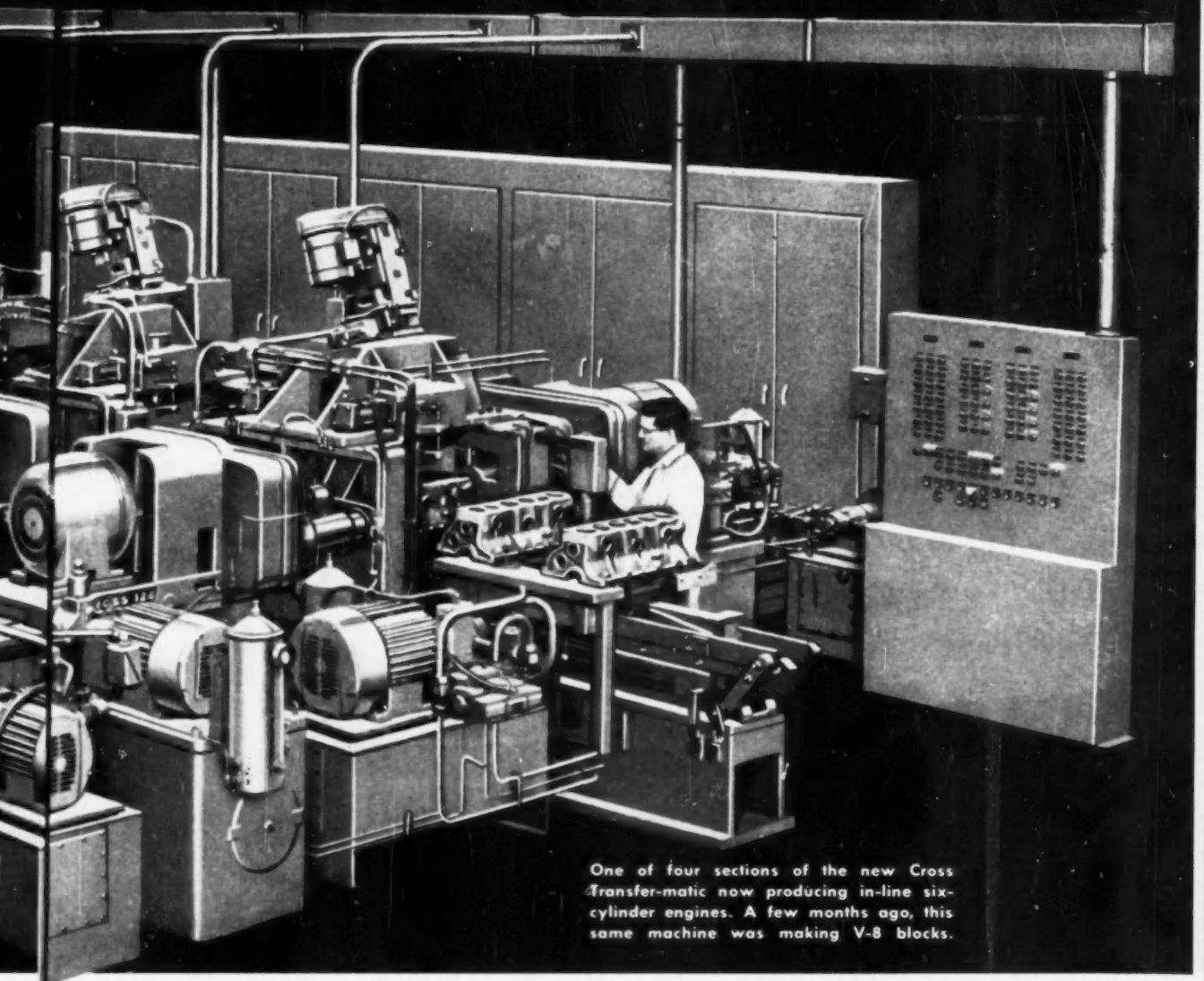
PART: In-line six-cylinder block.
OUTPUT: 100 per hour at 100%
OPERATIONS: Milling, drilling, boring, reaming and tapping.

Cross "Building Block" Construction Permits Reworking Line at 40% of Original Cost

A few years ago Cross delivered, to a large automobile manufacturer, three Sectionized Transfermatics for machining cylinder blocks for high powered V-8 engines. These machines introduced new concepts of flexibility by standardizing bases, transfer mechanisms, fixtures, heads and other component parts.

Last year, due to public demand, the car company had to make a quick switch from V-8 engines

Another Transfer-matic by Cross



One of four sections of the new Cross Transfer-matic now producing in-line six-cylinder engines. A few months ago, this same machine was making V-8 blocks.

to small in-line sixes. The new standards that Cross created for these Transfer-matics permitted the change to be made in a minimum amount of lead time and at a cost savings of 60%.

Today, one line is already producing in-line six-cylinder engine blocks and a second line is being converted for a production increase during 1960. This is proof positive that Cross engineered flexibility does pay off and that it costs no more.

Established 1898

THE **CROSS** CO.

First in Automation

PARK GROVE STATION • DETROIT 5, MICHIGAN

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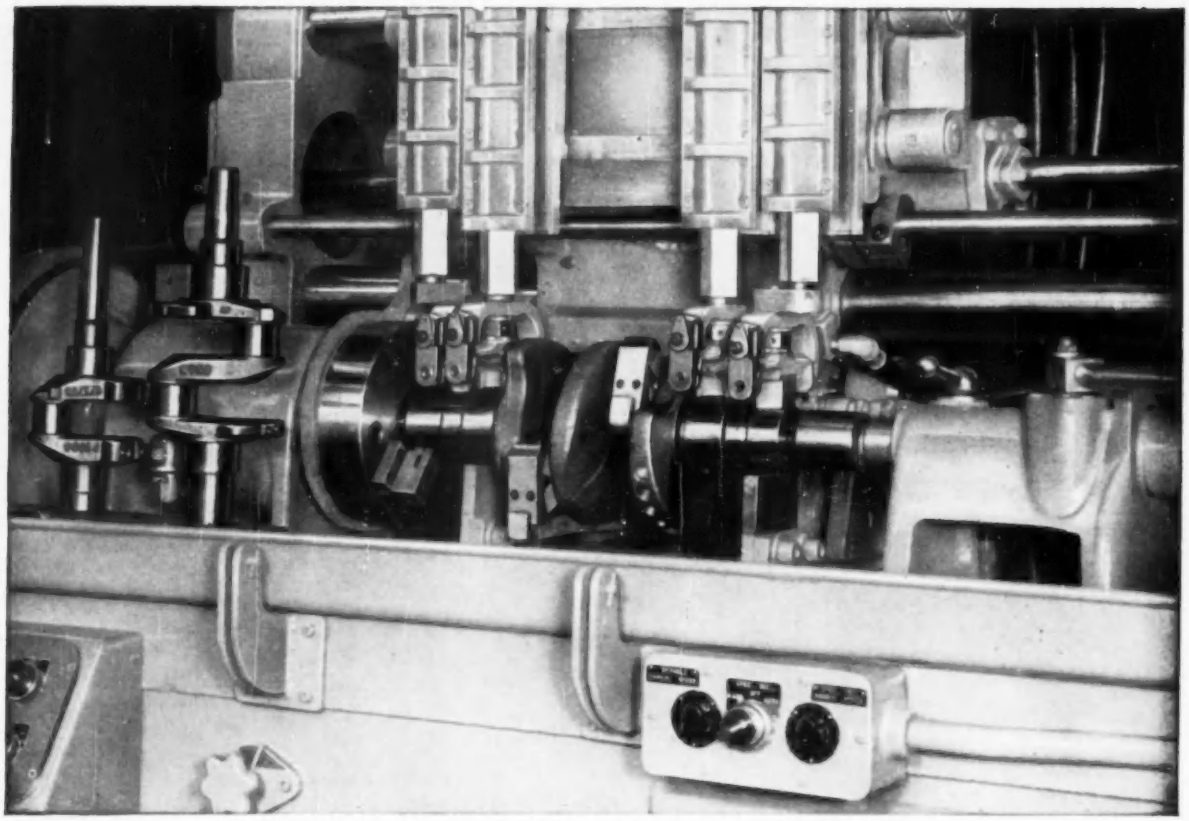


Gisholt 51A General-Purpose Superfinisher handles 44 to 53 crankshafts an hour with 80% efficiency—with one-hour change-over from one crank size to another. Each set of stones Superfinishes over 200 crankshafts on this job.

What Onan is doing with Superfinish

Handles crankshaft mains, pin bearings and oil seals simultaneously...gets finer finish at lower cost

There may be a tip for you in the way D. W. Onan and Sons, Inc., Minneapolis, is finishing crankshafts on a high-production basis.

Here's how a Gisholt Model 51A Superfinisher handles up to 6 different diameters in one operation, finishing a variety of single- and 2-throw crankshafts. Loading rails, with a special spindle-inching arrangement for driver positioning, make loading and unloading larger pieces fast and simple.

In a typical operating cycle, the crankshaft is driven between centers from the keyway, using a faceplate driver. Two special latch-on, follower-type arms engage with the crank pins, and 4 longitudinally adjustable quills descend to Superfinish main bearing and oil seal surfaces. Main and pin bearings are reduced from a ground surface of 30 micro-inches RMS to 8 or less. Oil seal surfaces on the shaft ends are Superfinished to 4 micro-inches or less.

Gisholt Superfinishing helps market your product more easily against rising competition. By reducing—or even eliminating—the cost of grinding, polishing, lapping or buffing operations, this modern method provides substantial savings. Chatter marks, grinding flats and amorphous "smear" metal left by grinding are completely removed, exposing true base metal for longer wear and better performance.

Ask your Gisholt Representative for details on the complete line of Superfinishing machines—including Superfinisher attachments, general-purpose models for job-lot production, and high-production models adaptable for automation. Make an appointment with him today—get the facts on this inexpensive process.

MASTERLINE GISHOLT SINCE 1887 GISHOLT

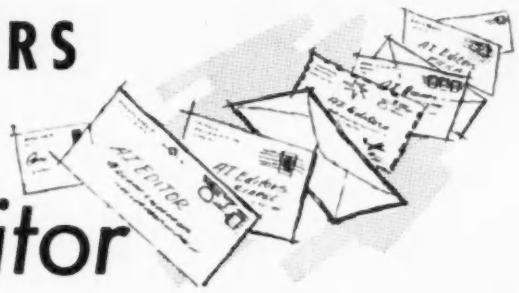
GISHOLT MACHINE COMPANY

Madison 10, Wisconsin, U.S.A.

WRITE TODAY for "Superfinishers" (Form 1169-A), 30-page illustrated booklet explaining Gisholt Superfinishing process in interesting detail.

ASK YOUR GISHOLT REPRESENTATIVE ABOUT GISHOLT FACTORY REBUILT MACHINES WITH NEW MACHINE GUARANTEE

LETTERS to the Editor



Readers' opinions or requests for additional information on material appearing in the editorial pages of AUTOMOTIVE INDUSTRIES are invited for this column. No unsigned letters will be considered, but names will be withheld on request. Address *Letters to the Editor*, AUTOMOTIVE INDUSTRIES, 56th & Chestnut Sts., Philadelphia 39, Pa.

ULTRASONICS

In your Tabloid column in the October 1, 1959 issue of "Automotive Industries" there is an article on the application of ultrasonics to die castings contributed by the American Charcoal Co.

Since I am very much interested in this process, I would greatly appreciate receiving the address of this company, along with any other pertinent information you may have available on this subject.

Donald Stinson
Chevrolet Motor Division
General Motors Corp.
Box 909
Toledo 1, Ohio

● *Suggest you contact Mr. Edward A. Day, General Manager, American Charcoal Co., 201 South Green St., Detroit 17, Mich.—Ed.*

SMALL VEHICLE COMPONENTS

I recently became interested in locating a manufacturer of small transmissions and differential assemblies up to 10 hp input; also front end steering assemblies or complete axle and steering units for vehicle weights of 500 lb or less.

I believe that one of the standard part vendors makes a transmission and differential in this size, but I haven't seen any reference to a manufacturer of small vehicle front axles and steering assemblies.

Robert T. Dahlberg
2003 East Hennepin
Minneapolis, Minn.

● *Can readers suggest sources of this equipment?—Ed.*

ORDNANCE SHOW

The article on Ordnance Day at Aberdeen Proving Ground in the November 1 issue is outstanding.

Willis Slaughter
The W. L. Maxson Corp.
460 West 34th St.
New York 1, N.Y.

● *Thank you for your kind comments.—Ed.*

I found the whole issue of Nov. 1, 1959, excellent, although my natural bias had me scrutinizing your coverage of the Aberdeen Proving Ground Meeting.

Congratulations upon this fine publication, including the splendid cover, which well introduced your article. We here at AOA were impressed with broad textual and photographic coverage and are highly appreciative for it.

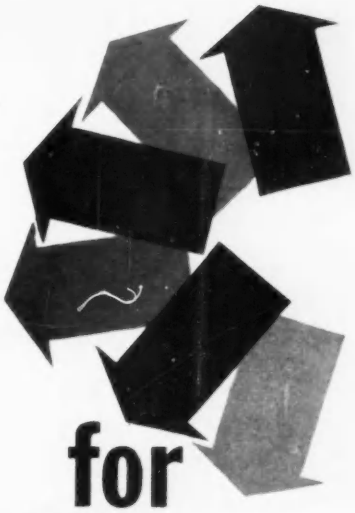
Henry C. Thayer
Colonel, U.S. Army (Ret.)
Director of Public Relations
American Ordnance Association
Mills Building
Washington 6, D. C.

● *Very pleased to receive your nice remarks—Ed.*

May I congratulate you on the very splendid report of the Aberdeen Show as given in the November 1st issue of AUTOMOTIVE INDUSTRIES.

Crosby Field
360 Furman St.
Brooklyn 1, N. Y.

● *We are especially gratified to receive this compliment from a most esteemed top medalist of mechanical engineering—Ed.*



for one source

STANDARDIZE ON SOUTHERN FASTENERS

Southern has many customers who know that for every screw requirement, Southern is the source "from which all fine fasteners flow." Southern is proud of being recognized as the source for customers who order and receive screws of highest quality, on time, and at a fair price.

If you haven't tried Southern as the source for your requirements, one order will convince you that you've been missing something. Write for Southern's current Stock List. Address: Southern Screw Company, P. O. Box 1360, Statesville, N. C.

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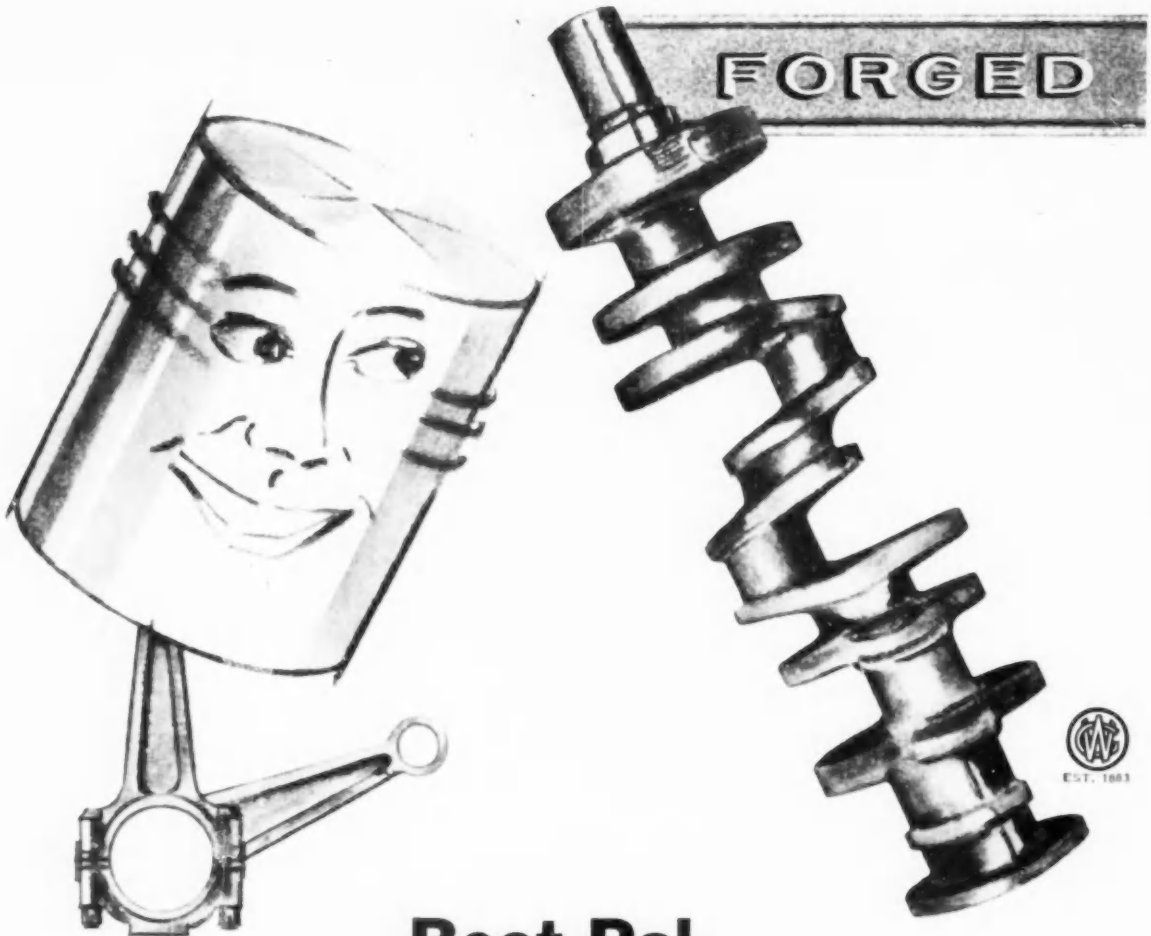
Circle 112 on Inquiry Card for more data



Best Pal
a Piston ever had

Crankshafts have been made successfully by other methods of fabrication and have proven good enough for certain non-critical applications but for maximum dependability of the modern, compact, high-compression, high-torque, heavy-duty engine a forged crankshaft is essential.

In a crankshaft there is no substitute for a forging, and in a forging there is no substitute for Wyman-Gordon quality and experience.

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Aluminum *Magnesium* *Steel* *Titanium* *Beryllium* *Molybdenum* *Columbium*

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FORT WORTH TEXAS
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LOS ANGELES CALIFORNIA

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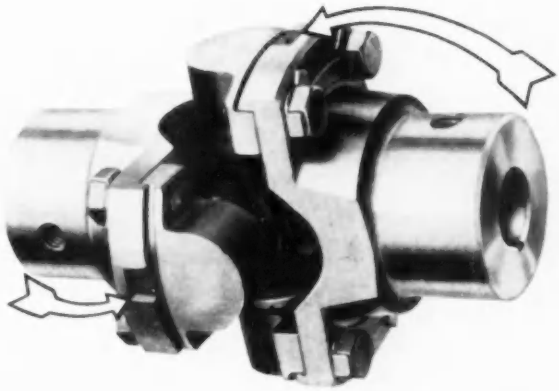
RUGGED POWER WHEN YOU NEED IT

Because MECHANICS Roller Bearing UNIVERSAL JOINTS drive through KEYS—instead of bolts—they stand up under punishment that shears off other types of fasteners. They are designed with less parts and connections for easy assembly and servicing—smooth running balance—maximum strength with less weight—and long, trouble-free, safe operation. During the winter snows, RUGGED POWER WHEN YOU NEED IT is just one of the advantages you get when you specify MECHANICS Roller Bearing UNIVERSAL JOINTS. Let MECHANICS engineers help you design this and other competitive sales features into your product.



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UNIVERSAL JOINTS

For Cars, Trucks, Tractors, Farm Implements, Road Machinery, Industrial Equipment, Aircraft

Circle 114 on Inquiry Card for more data

Photograph courtesy of Pacific Forge, Inc., Fontana, Calif.

Of course Pacific Forge is fussy about surface condition

On drill bits for Security Engineering Division, Dresser Operations, Inc., Aristoloy round-cornered squares meet this forger's stringent requirements. In-plant scarfing and grinding prior to forging have been eliminated—rejects caused by surface defects have been reduced to a minimum.

The secret—careful control of Aristoloy Steels from electric furnace melting to final rolling operations. The result—alloy steels of prime forging quality—and uniform chemical, structural, and hardenability characteristics that satisfy the critical use requirements for rock drill bits.

For complete information about Aristoloy structural alloy, stainless and carbon steels in leaded or standard analyses, contact the local Copperweld representative in your nearest large city. Or write for complete information.

ARISTOLOY STEELS

COPPERWELD STEEL COMPANY

ARISTOLOY STEEL DIVISION • 4025 Mahoning Ave., Warren, Ohio • EXPORT: Copperweld Steel International Co., 225 Broadway, New York 7, N. Y.

NEWS

Vol. 122, No. 1 January 1, 1960

Dart Move Was Smart

Dodge Sales Soar; Plymouth Holds Own

Some skeptics questioned Chrysler Corp.'s wisdom in bringing out the Dodge Dart and said it would downgrade the Dodge Div., long a stalwart in the middle price field. They also said it would spell the end of Plymouth, long the bread and butter line of the corporation.

And some added that the conglomeration of Dodge, Plymouth, Valiant and Dart would only confuse the customer and send him scurrying to the competition.

It looks now as if Chrysler made a smart move. The Dart has not hurt Dodge Div. sales or prestige. The Plymouth line is performing just about as expected and corporation sales are climbing as a result.

80 Pct. Rise in Sales

Thanks to Dart, retail sales of 1960 Dodge Div. cars are running nearly 80 per cent ahead of last year. The division delivered 44,655 new cars during the first two months of the model year (through Dec. 9), compared with only 24,955 a year ago. The increase was even greater during the first 10 days of December, up 135 per cent from 3241 to 7632.

Dart is running a consistent 80 per cent of total sales for the division, which means that about 36,000 Darts were sold during that early period to only 9000 larger Dodge Matador and Polara models. Any one of the Dart models—Seneca, Pioneer, or Phoenix—is selling more than the two 122-in. wheelbase Dodge models combined.

Volume seller in the 1959 Dodge line, the Coronet, was in the same price range with the Fury, Impala and Fairlane 500-Galaxie of the "low-priced three." The Dart Phoenix has taken over that position for Dodge Div. and the Pioneer and Seneca match the current low and middle series at Plymouth, Chevrolet and Ford.

'Low-Priced Four'

In other words, Dodge has abandoned the traditional medium priced group with its Dart and joined the so-called "low-priced three" to make a foursome.

But the larger, more luxurious, more powerful Matador and Polara, plus the D-500 power package, retain Dodge's prestige and position as a medium price car. Although volume sales are in the Dart, the deliberate downgrading, therefore, has been only in price.

Dodge is so intent on maintaining Dart's model-for-model competitive position with Ford, Chevrolet and Plymouth that a new Seneca fleet model, priced within a few dollars of the other fleet models, has been introduced.

And how has all this affected Plymouth? Not as badly as many critics predicted.

The Plymouth dealer group was reduced in size from 6308 to 4138 outlets with the start of the 1960 model year. The obvious results would seem to be proportionate drop in sales.

Plymouth Holds Own

Actually, the remaining dealers are stronger. In the introductory period for the '60 models, according to Plymouth, the 4138 remaining dealers increased their sales

CORVAIR ENGINE LINE

A view taken at Chevrolet's Willow Run, Mich., assembly plant shows resumption of Corvair engine conveyor line after steel strike.

49 per cent. This per-dealer increase just about balances the loss of outlets, so that Plymouth is holding its own this year.

Plymouth had counted on the Valiant to offset any loss of sales in the dealer realignment, but the steel strike delayed Valiant production, so that very few of the new compacts were available until the end of December and beginning of this month.

A true appraisal of Plymouth's situation is impossible until more compacts are in the dealers' hands, but it doesn't look as if Plymouth is suffering yet.

The over-all result is fewer but stronger Plymouth dealers with Plymouth sales bolstered by Valiant and increased sales for Dodge with the low-priced Dart carrying the weight. In the long run, the corporation expects higher total sales.

GM Appoints Kelley To Defense Post

General Motors is bolstering its new Defense Systems Div. with the appointment of Oliver K. Kelley as technical assistant to Harold R. Boyer, division general manager and GM vice president. Kelley had been chief engineer at Buick Motor Div. since 1957, joined GM in 1927 at Cadillac.

Lowell A. Kintigh, former assistant chief engineer at Oldsmobile, moves over to Buick as chief engineer, replacing Kelley.

More New Models Due in Few Months

More new cars are on their way, some of them this month.

The Chrysler 300-F high performance car is due Jan. 15. This will be the sixth edition of the special highway car with the top horsepower rating. Chrysler began shipping cars to dealers around the end of December; plans to unveil the 300-F at the Chicago Auto Show, with simultaneous public showings around the country.

Also due in January is the Cadillac Eldorado Brougham, another limited production, high-priced model. Cadillac literally missed the boat with the 1960 Brougham — first units built at Turin, Italy, did not get to the docks in time to make the scheduled sailing. The delay set back Cadillac a few weeks in its plans, but not enough to disrupt the January scheduling.

Two new compact models are due shortly. Falcon is scheduled to get into production on its station wagon in February, hopes to display the model before then. This will be a two-door wagon.

Also slated for introduction "in the near future" is a Corvair two-door sports coupe. Prices for this model (as announced last fall by Chevrolet) start at $1810 for the 500 series.

Next on the schedule is the Comet, first of the "medium small" cars, or "big compacts," as some choose to call them. (See AI March 15, Aug. 15, 1959.) This car will be sold by selected Mercury dealers, and will follow the lead set by the new Dodge Dart in the downward movement of the traditional middle-priced field.

But Dodge will be ready with another car before the year is up. Still without an official name, the Dodge "D" car will be a larger version of the Valiant. This will fall in the same size and price group as the Comet.

The Buick, Oldsmobile and Pontiac compacts will join this group before the 1960 model year is over.

Phone Network Links 40 Chrysler Plants

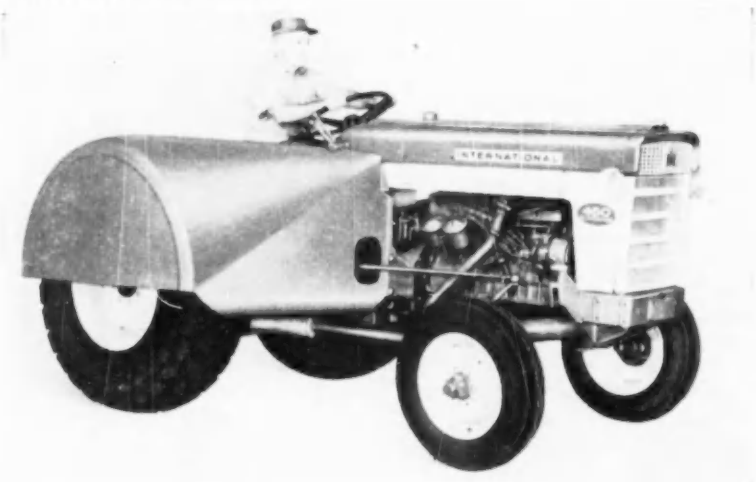
A new nationwide telephone network linking 40 plants and offices makes Chrysler Corp. about the most communicative manufacturer in the U. S.

The elaborate system, installed in late December by Michigan Bell Telephone Co., makes it possible to dial any Chrysler plant. The hook-up is described as the largest of its kind in the nation.

The 29 plants and offices in southeastern Michigan are part of a special network with direct dialing to the desired extension number. The other 11 plants are brought in by 14 long lines furnished by American Telephone & Telegraph.

With the new lines, Chrysler's 40 plants are linked by just about every kind of rapid communication, including teletypewriter and data processing machines which transmit computer information.

TRACTORS WITH FENDERS



New fenders built by International Harvester Co. allow tractors to work closer and faster around branches and vines. Fenders are designed for use with International 340 and 460 Utility tractor. They are available with full cowling and skirt—or with skirt only—for mounting at factory or in the field.

Orders for Caravelle Mount; January Deliveries Likely

Top spot in the American imported car market is sought by Renault, Inc. with availability of production models of its Caravelle sports car.

The new car has been added to the Dauphine and 4CV lines, combined sales of which rose to 85,131 in the first 11 months of 1959. This was more than double the number sold in the same months in 1958.

Robert E. Valode, vice president and general manager of Renault, Inc. said "Renault's 850 dealers now hold orders for as many Caravelles as we had expected to bring into this country in the next 11 months. Shipments will begin arriving this month and are due to reach a peak of about 2000 a month. Efforts however, are being made to step up shipments in hopes of meeting this unexpected demand."

The new sports car will be available in three models, soft-top convertible, hard-top coupe and convertible with removal hard-top. They are priced from $2395 p.o.e. New York.

Like the Dauphine and 4CV lines, the Caravelle has its engine in the rear. The power plant, developed from the Dauphine engine, has been stepped up to 40 hp.

Dow Shifts Plant

The Dow Met. Products Co. has transferred its magnesium and aluminum diecasting production operations from Midland, Mich., to nearby Bay City, Mich.

BRITISH BUS CHASSIS

Leyland Leopard bus chassis is built on a 16 ft, 2 in., wheelbase and is intended for a 30 ft by 8 ft body. It weighs just over four tons with a GVW of 11 tons. The mid-mounted, under-floor horizontal Diesel engine of 597 cu in. displacement develops 125 bhp at 1800 rpm, driving through a four-speed transmission and optional two-speed axle.

PULMINO USES FIAT MULTIPLA FRAME

The Pulmino, built by Viotti of Italy, is a special version of Fiat's Multipla 600. It has two doors on each side and is designed so that the seats can be removed easily from one side of the vehicle. In addition the backs of the seats can be lowered to form a bed. Vehicle is powered by a four-cylinder, 22-hp engine and has a load capacity (including driver) of 1036 lb. Overall height is 50.7 in., width, 54.9 in.

SAE Handbook Ready; Contains 375 Reports

The Society of Automotive Engineers 1960 Handbook, with 18 per cent of its technical reports either new or revised, represents the cumulative effort of SAE technical committees for 46 years. It directly or indirectly affects every ground, air, and space vehicle being built in the U. S. today.

The 903-page volume contains 375 reports, of which 16 are new, 67 revised and 53 reaffirmed. Developed and up-dated by scores of technical committees, the reports provide dimensional specifications, test requirements and procedures and material compositions.

New reports include truck transmission test code, mechanical power outlet test code, air brake reservoir and inspection procedure, motor fuels, light output meters and tractor tie load and inflation.

NEWS

CONTINUED

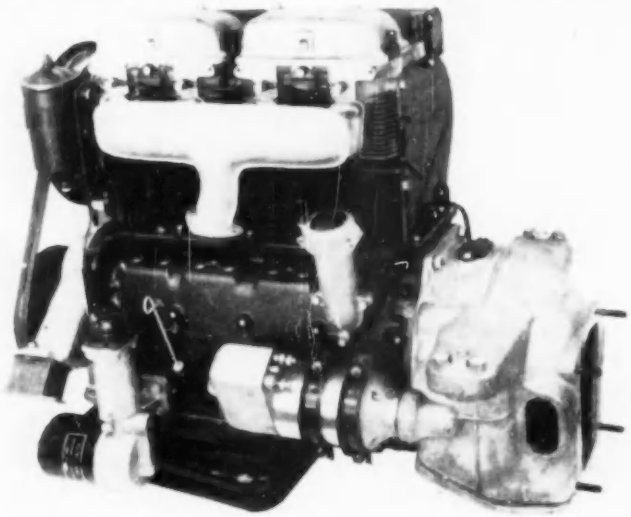
Chrysler Absorbs American Foundry

Chrysler Corp. has absorbed the American Foundry Company, Inc., of Indianapolis as a part of the Forge and Foundry Div. American Foundry formerly was a wholly-owned subsidiary of Chrysler.

A. L. Gostow, general manager of the F&F Div., says the change, which involves only the legal status of American Foundry, will not affect employment (1550 persons) at the two Indianapolis plants. Earl Guckelberg continues as manager of the operation.

The two plants include a gray iron foundry and new aluminum casting facilities. Products include aluminum intake manifolds for the new slant six cylinder engine, V-8 engine blocks and automatic transmission cases. The block for Chrysler's first aluminum engine, expected sometime this year, also will be cast in the Indianapolis plants.

ITALIAN TRUCK HAS OPERATING ECONOMY



This Lupetto truck, produced by the OM Works, is designed for economical transportation. It is powered by an aircooled, four-stroke direct-injection, CO1K Diesel engine with a displacement of 253.516 cu in. Output is 56 bhp at 2200 rpm.

AC Cruise Control Offered to Makers

AC Spark Plug Div. is offering its new vacuum-operated cruise control system to all manufacturers as a factory-installed option. The system, called "ACon-O-Cruise," is designed to sell for about half the price of current devices, according to AC.

Taking its power from the engine manifold, the unit does not require electric motors. This, says AC chief Joseph A. Anderson, means it is less expensive to manufacture and easier to install.

The system combines an adjustable speed control setting, and a driver warning signal that gives a back pressure on the accelerator pedal. The control disengages when the brake pedal is touched.

Airless Tires Seen By Using Urethane

Automobile tires that need no air and smaller "humps" under the floor of cars are some of the plans for the future as seen by Leora E. Strake, research librarian for the Goodyear Tire and Rubber Co.

Airless tires would be achieved by filling the space inside the tire with a special urethane foam similar to the material used as "crash panelling" on some automobile dashboards.

Another form of urethane can be used to join the front and back portions of automobile drive shafts which could lead to smaller drive shafts "humps" in future autos.

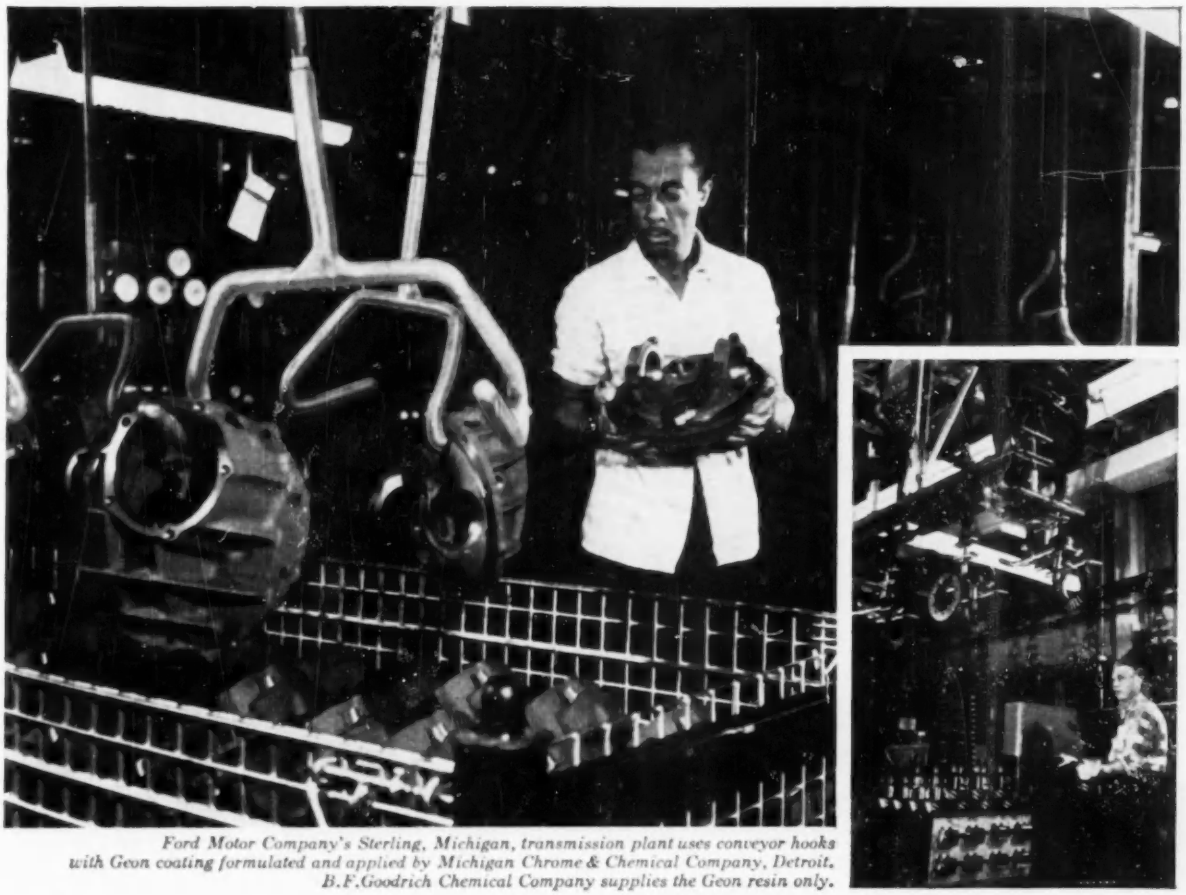
Russia Leading U. S. In Tire Equipment

Russia has more modern tire curing equipment than United States plants, Russell DeYoung, president of the Goodyear Tire & Rubber Co., told a recent company conference.

"The Soviets have purchased enough 75-inch automatic curing machines, built under U. S. license and purchased from England, to turn out 20,000 truck tires a day. This means there is more of this modern equipment in Russia today than in the U. S.," DeYoung said.

Another new development using

B.F.Goodrich Chemical *raw materials*



Ford Motor Company's Sterling, Michigan, transmission plant uses conveyor hooks with Geon coating formulated and applied by Michigan Chrome & Chemical Company, Detroit. B.F.Goodrich Chemical Company supplies the Geon resin only.

"Soft touch" of Geon safeguards parts quality

The overhead conveyor system in this automatic transmission plant uses 26,000 hooks coated with Geon polyvinyl material. The soft yet durable coating made from Geon protects finished parts while they are carried from machining to assembly stations.

In addition to giving the hooks a long and profitable service life, the Geon coatings come in any color, permitting color-coding for multiple conveyor operations.

Versatile Geon is ideal for many coating applications, since it disperses readily in the coating formula. Geon can be used to coat paper, textiles, metals or almost any material to provide new or improved advantages. Hundreds of types of Geon resins, plastics, latices and polyblends are available, tailored to specific uses for coatings, moldings, extrusions, or rigid or foam applications. For information, write Dept. GT-1, B.F.Goodrich Chemical Company, 3135 Euclid Avenue, Cleveland 15, Ohio. Cable address: Goodchemco. In Canada: Kitchener, Ontario.

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Circle 116 on Inquiry Card for more data

Electronic parts courtesy Judson Mfg. Co., Inc., Cornwells Heights, Pa.

Mirror-bright without polishing, after switch to Sunicut

Boring on a multiple-spindle automatic produced the finish you see on these electronic parts. Sunicut 102-S Cutting Oil saved time and money by eliminating the polishing operation. The same automatic uses Sunicut 102-S to machine metals ranging from titanium to stainless 410.

Sunicut 102-S is one of a full line of cutting oils known throughout metalworking for maintaining long tool life, close tolerances, and fine finishes. There's a grade of Sunicut that can help you improve your product quality—and *that's* the best economy of all.

To choose the right Sunicut, ask the Sun man; that's part of his service to you. Or write to **SUN OIL COMPANY**, Dept. **AA-1**, *Philadelphia 3, Pa. In Canada: Sun Oil Company Limited, Toronto and Montreal.*

SUNOCO

MAKERS OF FAMOUS CUSTOM-BLENDED BLUE SUNOCO GASOLINES

NEWS

FEATURES

Auto Makers Revise Forecasts, Expect '60 Sales to Top 7 Million

One rosy result of the steel strike is that the automobile sales outlook for 1960 is far brighter than it was four months ago.

Last fall, industry leaders were predicting new car sales in the neighborhood of 6.5 to 6.9 million for the year. Now, because of the delayed availability of '60 models, revised forecasts place the 1960 potential well above 7 million. This would make this year second only to 1955.

The industry fell behind an estimated 700,000 cars because of the steel strike. Whether all of these sales can be regained during 1960 is doubtful. But most of the would-be buyers from the final quarter of '59 are expected to make their move as soon as cars are available to them this year.

Expect 7 Million Sales

This is the pent-up demand that is counted on to boost 1960 sales above 7 million. (A strike of major proportions could, of course, hold sales down again).

Most optimistic prediction comes from George Romney, president of American Motors, who says sales will be between 7 million and 7.25 million. Romney, champion of the compact car cause, says that Rambler-size automobiles will account for about 2.35 million sales in 1960, or roughly one-third.

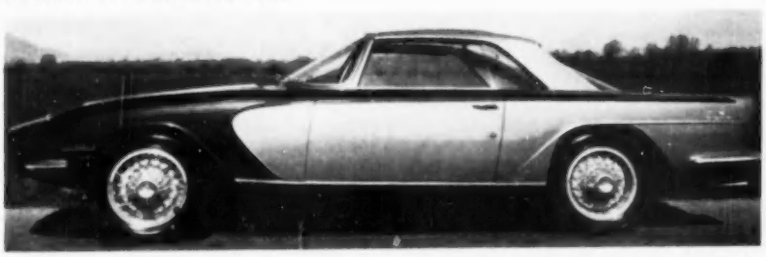
L. L. (Tex) Colbert, Chrysler president, foresees a sales volume that will "reach and probably exceed" 7 million units. He points out that postponements from the last quarter have caused upward revisions of production schedules, with an all-time record first quarter of 2.24 million cars planned.

But Colbert, like Romney, gives much of the credit for the higher sales potential to the greater public interest in new automobiles of all price classes.

Frederic G. Donner, GM board chairman, has boosted his corporation's forecast slightly to 7 million cars and one million trucks, up 100,000 passenger cars from last fall's prediction.

Henry Ford II concurs in the 7 million-plus figure for 1960 and goes a step farther. He says that by 1965 the normal rate of new car sales will be close to 7.5 million units a year and the normal new truck market will approach 1.5 million a year by the end of the new decade.

SPORTY ITALIAN MODEL



Custom-made Blue Ray II is powered by Lancia B-20 engine that develops 140 bhp at 5500 rpm. It has a compression ratio of 8.4 to 1. Built by Nardi & Co., of Torino, Italy, it has a body designed by Giovanni Michelotti.

360 HP Engine Offered by Ford

They're not saying much about it, but the Ford Div. is offering more horsepower. The division is selling, in limited numbers, a new engine, called the 352-4V Special, which delivers 360 hp at 6000 rpm.

Because of the Automobile Manufacturers Association resolution that supposedly put an end to the "horsepower race," Ford is not advertising or promoting this engine publicly. (Suggested retail price is $204.70 above Ford's 292 cu in. V-8.)

The engine has a 352 cu in. displacement, 4X 3½ bore and stroke, and 10.6 to one compression ratio. It is fitted with a single four-barrel carburetor, high-performance camshaft, mechanical valve lifters, heavy duty rod and main bearings, low restriction exhaust manifold and aluminum intake manifold.

TABLOID

Alumina powder can replace semifluid materials to insulate or "pot" transformers in hermetically sealed cans, says Bell Telephone Laboratories. The powder has a melting point over 2700F, well above the operating temperatures of any electrical apparatus.

* * *

A new tread compound that takes the squeals and screeches out of passenger tires is being made by B. F. Goodrich Tire Co. The "quiet" rubber absorbs road shocks and reduces steering effort. It is being used in tires for 1960 automobiles.

* * *

Rubber made from tin may meet the space age demand for materials that resist heat and flames, an Army research report says. The key element of the new type rubber is tin, rather than carbon. The tin compounds, known as alkyl methacrylate polymers, stretch like rubber and can be vulcanized.

* * *

Monsanto Chemical Co. plans a huge plant in European Common Market to make plastic sheet out of Saflex polyvinyl butyral. The sheet is used as a plastic interlayer for laminated safety glass for automobiles.

* * *

The Franklin Institute Laboratories have used chromite catalysts and carbon monoxide to cut the amount of nitrogen oxides from car exhausts. In some tests, nitric oxide was reduced by as much as 90 per cent.

* * *

A machine that twirls solid particles at a G-force 40 times greater than that experienced by an astronaut in flight was developed by the Chemical Machinery Division of Baker Perkins, Inc. Materials under pressure are subjected to a centrifugal force of 1000 Gs as they are rotated at 154 mph. Production capacity of the machine is 30 tons per hour.

Plans to market a premium quality tire made of butyl rubber have been announced by Firestone Tire & Rubber Co. This will be the first premium butyl rubber tire to be added to the line of any major rubber company, Firestone says.

* * *

Crane Packing Co. has completed the first plant devoted exclusively to the processing of Du Pont Teflon. The new facility will produce basic Teflon shapes—sheet, rod, tubing, and tape.

* * *

Minnesota Mining & Mfg. Co. will build a 14-story administration building at its research center, east of St. Paul, Minn. It will house all the company's research and administrative facilities.

* * *

Twenty-five per cent of the fuel used by an economy car is consumed by the drag of its tires, says Dr. G. B. Roberts, of Dunlop Rubber Co., Ltd. Drag increases rapidly at higher speeds, while a load increase of 20 per cent increases the drag by about 10 per cent.

* * *

An automatic fan cut-off reduces fuel costs by as much as 10 per cent, says Warner Electric Brake & Clutch Co. The device, designed to cut work load on the engine, will be offered by International Harvester Co. on its 1960 truck engine line.

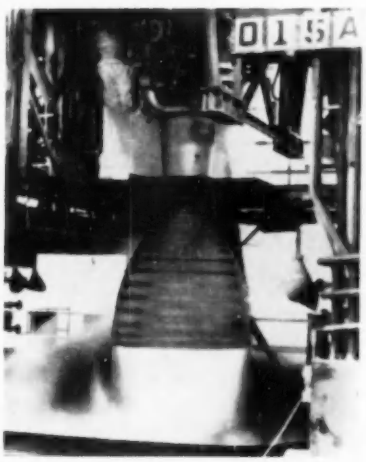
* * *

Timken Roller Bearing Co. is selling its British subsidiary, Fischer Bearings Co. Ltd. of Wolverhampton, to the Fafnir Bearing Co., New Britain, Conn. Timken will concentrate on sale of tapered bearings.

* * *

Construction of an Air Reduction Sales Co. plant at Baton Rouge, La., is under way. It will have a daily production capacity of 30 tons of liquid oxygen and nitrogen.

ROCKET ENGINE



First photograph shows Rocketdyne research engine being test fired in field laboratory. Developed by Rocketdyne Div. of North American, the engine is in the 400,000-lb thrust class. Although it is not slated for a specific vehicle, Rocketdyne is contributing data on combustion, turbo machinery design, and systems operation for very high thrust engines.

Mexico Plans Big Cut In Car Imports

The Mexican government is planning a drastic cutback in car imports, according to Armando Fernandez, president of the National Association of Distributors.

Last year, the Department of Economy reported, a total of 80,000 cars was purchased at a cost of $120 million (1.5 billion pesos). This year, extremely high tariffs on so-called "luxury" cars resulted in a switchover to the small economy cars. If the import quotas are reduced in 1960, even the small cars will be hit, says Fernandez.

The presidential decree of last March, which fixed maximum prices for small cars, also contributed to the sharp rise in demand for these vehicles.

Soviets Reveal Details on Small Car Engine

Russia has disclosed more details of the rear-mounted engine that will power its new small car now in production at the Communard factory in Zaporozhye (see AI, June 15, 1959).

The model, popularly known in the West as the "Volksfiatovitch," is a blend of Volkswagen and Fiat 600 features. The sectional drawing of the engine (see illustration) shows that it's a virtual copy of the VW power plant, although of a smaller swept volume.

The air-cooled flat-four, with a 2.6-in. bore and 2.16-in. stroke, has a displacement of 46 cu in., against 72.7 cu in. for the German original. With the same compression ratio of 6.6 to 1, it develops 20 hp at 4000 rpm compared with 36 hp at 3700.

Design and construction of the two units are nearly identical. The crankcase and cylinder head castings of the Soviet version appeared to be slightly altered, however, and the combustion chambers are of a different shape.

Dayton Forms New Firm

Formation of a new joint company to sell automotive and industrial rubber products in Europe's common market was announced by Richard D. Rosenberg, manager of Dayton Rubber International.

The new company was formed by the Dayton Rubber Co. and N. V. Vereenigde Nederlandsche Rubberfabrieken, known as "Hevea," in Arnhem, Netherlands.

"This is the first time Dayton Rubber has entered into a licensing agreement for foreign manufacture of any of its patented proprietary products," Rosenberg said.

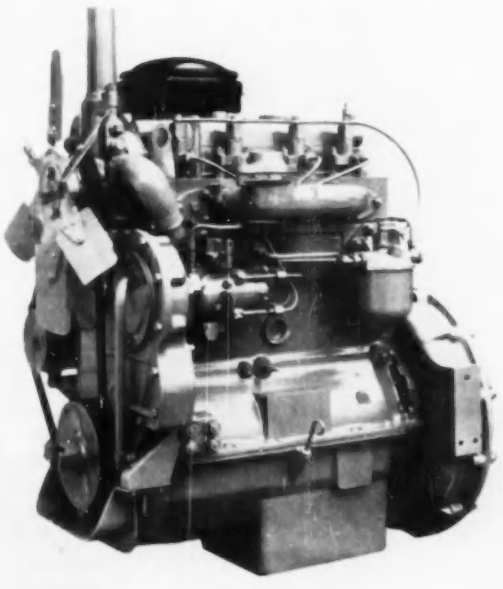
The products, carrying the Dayton-Hevea label, will include automotive V-belts, cog belts, varispeed V-belts, flexible radiator and vacuum hose, printing and industrial rollers, foam latex and the new polyether foam.

Perkins Diesel

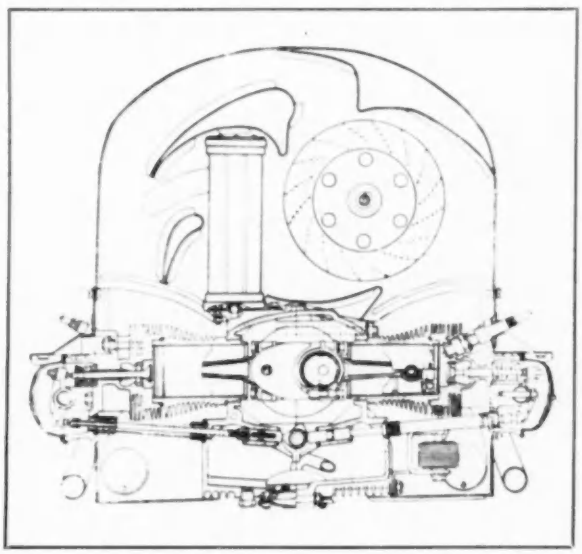
Perkins Engines Ltd., of England, is offering a new industrial Diesel for use in fork lift truck, welding sets, mobile cranes, and industrial tractors.

The engine features a high-level camshaft, chrome-plated thin-wall cylinder liners, a manifold heater for cold starting, and decompressors for hand cranking. Designated "Four 203," it has a displacement of 203.5 cu in. and develops 60 bhp at 2400 rpm. Maximum torque is 151 lb/ft at 1350; bore and stroke, 3.6 in. and 5 in.; and compression ratio, 17.4 to 1.

New industrial Diesel offered by Perkins ▼



New Soviet engine is copy of VW power plant ▼



CESSNA DELIVERS T-37B JET TRAINER

Cessna Aircraft Co. delivered the first T-37B jet trainers to the Air Force last month. The twin-jet intermediate trainer is a modified version of the "A" model. New trainer is powered by twin Continental J-69-25 engines, each with 1025-lb thrust. Also featured is a new M5 ejection seat, and improved communication and navigation equipment.

New Electronic Device Checks Fighter Plane in 60 Seconds

A new device that allows a fighter pilot to check his electronic gear in 60 seconds has been developed by Republic Aviation Corp.

The system, called RADFAC, is designed to speed up checks of electronic gear in the F-105, the Mach 2 fighter-bomber plane Republic is building for the Air Force.

RADFAC is housed in a trailer which can be transported by air and has self-contained power sources. It can be as far as two miles away and still function well, according to Republic.

Here is how the system works:

A pre-flight mechanic seated in the trailer activates his remote control unit upon a signal from the pilot. At once, RADFAC locates the aircraft to be tested and locks on to it. It then goes through a programmed series of preflight tests, telling the pilot (verbally or by tone signals) if anything is wrong.

Any planes within RADFAC's operational radius can query it and check out their own systems, one at a time or simultaneously.

Although built especially for the F-105, the new system can easily be adapted to other aircraft, Republic said. The first RADFAC unit, now being completed, is slated to go into operation next month. Four additional units are on order.

Raytheon to Develop Radar for ARPA

A unique radar that will track ICBMs thousands of miles away will be developed for the Advanced Research Projects Agency by Raytheon Co.

The giant radar will make microwave measurements of missiles outside the earth's atmosphere, compiling a billion bits of data on every run. Work will be done by the Missile Systems Div. under a $15 million contract.

Named "Pincushion" the new radar will be used with "Project Defender," ARPA's advanced defense project against ICBM attack. Its multiple beams will keep a continuous fix on the ICBMs.

Key to Pincushion's range is a series of new Amplitron power tubes, which make it possible to generate tremendous power levels in a relatively small space.

Master Clock to Time Space Flights

Telemeter Magnetics, Inc., has received a contract to develop airborne digital programmers for the Project Vega space exploration vehicle.

The award, totaling nearly $400,000, was made by the Jet Propulsion Laboratory of the California Institute of Technology, project manager and prime contractor.

Role of the programmer will be to set the course for flight control from ground-based equipment, according to Trude C. Taylor, TMI vice-president. The program will serve as the master clock to time functions and thus regulate the vehicle's flight.

Before firing, the program is checked against actual launching conditions. If conditions vary from those on which the program is based, an alternate program can be loaded into the system's core magnetic memory.

Mr. Taylor said the Vega programmers and data systems will use multiple aperture cores that provide nondestructive read-out. This eliminates the additional circuits required in most commercial computers, where it is necessary to rewrite the information after a read-out.

Putt Elected IAS Head

Lt. Gen. Donald L. Putt (USAF, ret.) was elected president of the Institute of Aeronautical Sciences for 1960.

General Putt's election was announced by William Littlewood, 1959 president, at the 1959 National Midwestern Meeting recently. The new head of IAS is president of United Research Corp. of Menlo Park, Calif., a newly formed subsidiary of United Aircraft Corp. General Putt retired from the Air Force in 1958 after 30 years of service.

Helicopter Airline Buys Six S-61s

Sikorsky Aircraft Div. of United Aircraft Corp. announced the sale of six S-61 helicopters to Chicago Helicopter Airways. This brings to eleven the total number S-61s ordered by helicopter airlines.

Lee S. Johnson, Sikorsky general manager, said first delivery of the S-61 is slated for early 1961. Initial flight of the multi-turbine helicopter is scheduled for next year.

The S-61 will carry 25 passengers, plus air mail and baggage and will have all-weather capability. It will be powered by two GE T-58-8 gas turbine engines of 1250 shp each. Price, fully equipped, was given as "approximately $650,000."

NASA Asks More Space Funds

Money for all kinds of space exploration contracts is running short. The National Aeronautics and Space Administration says it needs about $30 million right away. This sum is to be spent between now and June 30.

NASA is in charge of such space projects as Mercury (a manned space capsule) and Saturn (huge rocket being developed by Dr. Wehrner Von Braun at Huntsville, Ala.)

Congress voted $500 million for NASA activities this year, about $30 million less than was requested. In addition, contractors, faced with rising costs, are raising the prices charged the Government. This two-way squeeze is hurting.

NASA expects to ask for about $800 million in the new budget due to go into effect July 1. Officials of the agency have warned Congress repeatedly that their costs must necessarily rise by leaps and bounds in the years ahead. Projects begun in 1959 and 1960 are not being charged up to current budgets. Consequently, when the bills fall due (in 1961 and later years), the taxpayers are in for a real jolt.

'COPTER TRANSPORTS BRIDGE

A fully decked bridge (103 ft long) is carried aloft by British heavy-duty helicopter. Tests started earlier this year in England with an undecked bridge. The craft, built by Westland Aircraft Ltd., powered by two Napier Eland turboshaft engines, carried the finished bridge at nearly 70 knots and completed turns of 30 degrees. The heavy-duty helicopter will also be in a passenger or troop carrying version, seating up to 46 passengers.

New Space Center

Cornell University announced it has launched the first big center for radiophysics and space research to be university sponsored.

As its principal tool, the new center will have a giant radar that will make it possible to bounce radar waves off the planet Jupiter, about 400 million miles away when closest to earth.

The radar will have a 1000-ft wide dish and a 600-ft high tripod that supports the feed antenna. Located in Puerto Rico, it will send signals at a power peak of 2.5 million watts and a frequency near 420 megacycles.

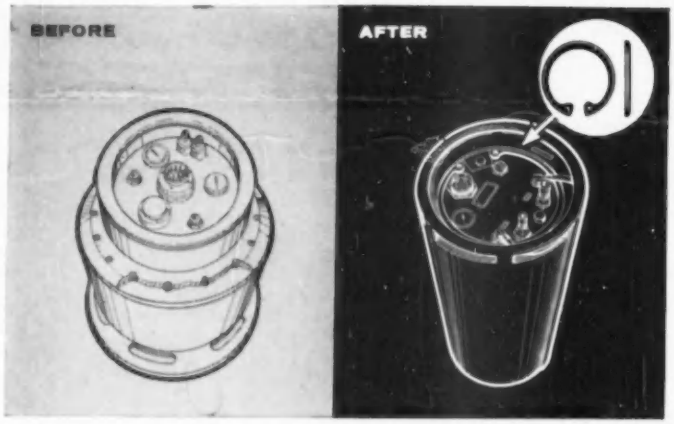
The radar will measure electron density and temperature at different heights and times in the earth's ionosphere, and to heights of one or more radii of the earth. It also may measure ionization and detect transient streams of aurorae.

Convair Research

Convair Div. of General Dynamics Corp. has formed a new space research section at its Fort Worth, Tex., plant.

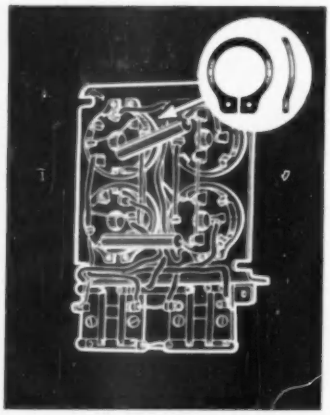
Dr. E. L. Secrest, who heads the new section, said initial studies will be made of the outer atmosphere, physics of high-energy particles, and astronomical science. These studies will be used in the design of space vehicles of the future, he added.

Truarc rings for end-play take-up offer significant design advantages

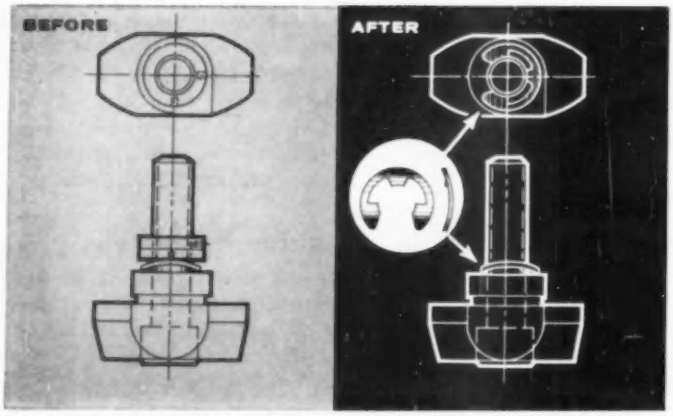


Pressure cover design simplified. Two axially assembled Truarc Series 5002 beveled rings eliminate 27 bolts, reduce machining and assembly time from 78 to 1½ hours and make possible drastic size and weight reductions. Rings retain two covers of a pressurized x-ray unit. **Savings: about $500 per unit.**

Parts eliminated in slide assembly. Two radially assembled Truarc Series 5139 Prong-Lock® Rings provide proper spring tension, eliminate looseness and wobble in this office calculator shift-slide. Original design called for a cut washer, spring washer, and cotter pin — all eliminated.



New way to install electron-tube sockets. Easy-to-apply Truarc Series 5101 bowed external rings lock tube sockets to chassis plate in this assembly. Bowed construction takes up tolerances of molded grooves, thickness of base. Individual sockets are removable for field service.



Quarter-turn clamp improved. A bowed washer and two locknuts were eliminated in this quarter-turn jig-and-fixture clamp by a Truarc Series 5131 bowed E-ring. The radially assembled ring holds the screw captive, provides required rotational drag between parts with sufficient tension to insure tight fit when the screw is first engaged. **Typical savings: $1.35/unit—assembly up 70%.**

A number of Truarc retaining rings are available to take up end-play or loose fit caused by accumulated tolerances and wear. The rings often eliminate spring washers, collars and set screws, nuts, bolts, rivets, cotter pins and other conventional fastening devices with outstanding cost savings in machining and assembly time.

Truarc retaining rings designed to deal with the end-play problem are of two general types: **bowed rings** for resilient end-play take-up and **beveled rings** for rigid end-play take-up.

Bowed retaining rings are widely used for preloading bearings, preventing vibration or oscillation in linkages, providing tension on adjusting screws. Of particular interest is the radially installed Truarc Prong-Lock® ring which locks securely to the shaft by means of two prongs. It provides exceptional thrust load capacity, may be used as a shoulder against rotating parts, and often eliminates springs, bowed washers and other tensioning devices.

In beveled rings for rigid end-play take-up, the groove-engaging edge is beveled at 15°. There is a corresponding bevel on the load-bearing groove wall. To take up end-play, the ring acts as a wedge between the outer groove wall and the part being retained.

These are just a few of the 50 functionally different types of Truarc retaining rings. They come in up to 97 standard sizes, six metal specifications, 13 different finishes. The entire line as well as accessory assembly tools, grooving tools, and over 70 typical applications are shown in the new catalog RR 10-58. Write for your copy today. And remember Waldes Truarc engineers are always ready to work with you on your specific projects. Waldes Kohinoor, Inc., 47-16 Austel Place, Long Island City 1, N.Y.

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MEN IN THE NEWS

Timken Roller Bearing Co., Bearing and Rock Bit Div.—H. A. Tobey was elected vice-president, manufacturing.

Armstrong Cork Co. —M. J. Warnock was elected a member of the Board of Directors and designated senior vice-president.

Gillett & Eaton, Inc. —R. W. Howard was elected vice-president.

Bendix Aviation Corp.—R. H. Isaacs has been named vice-president in charge of government relations.

Kaiser Aluminum and Chemical Sales, Inc.— C. W. Unbehaun was appointed engineering manager of automotive sales.

Ford Motor Co.—P. H. Ponta was appointed director of manufacturing engineering, succeeding J. F. Randall, who was named manager of Ford Div.'s expanded manufacturing engineering operations.

ACF Industries—**R. C. Taylor** was elected president and **J. F. Clark** chairman of the executive committee.

Eaton Mfg. Co., Central Research Div.—**G. R. Pipes** was promoted to assistant manager; **H. A. Frost**, manager of product development; and **J. E. Urbassik**, automation manager.

Raytheon Co.—**W. R. Hutchins** was made scientific liaison officer.

B. F. Goodrich Co.—**E. R. Bartley** was named manager of marketing research.

Willys Motors, Inc.—**J. H. Drum** is now director of government sales.

Taylor Fibre Co.—**J. J. Kelly** has been appointed assistant to the vice-president, manufacturing.

Allis-Chalmers Mfg. Co., Farm Equipment Div.—**J. F. Foley** was made advertising manager of the Tractor Group.

Dodge Div., Chrysler Corp.—**P. E. Butcher** was promoted to national dealer placement manager.

Bendix Aviation Corp., Eclipse-Pioneer Div.—**M. F. McCammon** was promoted to general manager and **J. E. Bevins** to assistant general manager.

Auburn Mfg. Co.—**M. B. Weiner** and **J. L. Urgo** have been appointed vice-presidents.

General Electric Co., Chemical and Metallurgical Div.—**Dr. C. E. Reed** was named general manager.

Associated Spring Corp.—**F. E. Crist** was elected vice-president, administration.

Clinton Engines Corp.—**J. L. Champion** was named director of purchasing and production control.

Borg-Warner Corp., Ingersoll Products Div.—**B. A. Lucas, Jr.**, was appointed vice-president in charge of sales.

Champion Spark Plug Co.—**H. F. Davis** was promoted to general sales manager.

Chrysler Corp.—**R. G. Smith** was named director of consumer research; **R. L. Walsh**, director of business research; and **J. W. Waters**, director of market planning.

Eaton Mfg. Co., Automotive Gear Div.—**R. C. Jacobs** was promoted to assistant general manager.

Electric Autolite Co., Replacement Sales Div.—**E. E. McKeever** was named Eastern regional manager and **R. W. Higgins** assistant general sales manager.

Pennsalt Chemicals Corp.—**A. H. Clem** was named vice-president of marketing and **G. R. Lawson** succeeds him as general manager of the Chemical Specialties Div.

Behr-Manning Co.—**D. H. Kay** was made automotive sales manager of the Los Angeles Div.

Bassick Co.—**F. E. Hummel** was appointed manager of distributor sales and marketing.

Lyon, Inc.—**H. J. Keane** was named assistant sales manager of automotive products.

Burroughs Corp.—**Dr. C. L. Register** was promoted to program manager—ALRI (Airborne Long Range Input).

Aro Equipment of Canada Ltd—**K. H. Zinsmaster** has been promoted to vice-president and general manager.

Necrology

L. C. Boos, 56, vice-president of U. S. Rubber Co. and general manager of its international division, died Dec. 7, at Cos Cob, Conn.

H. O. Gomoll, 56, formerly a purchasing agent for Dana Corp., died Dec. 7, at Toledo, O.

F. I. Tone, an automotive pioneer and former research engineer for Dodge Brothers, died Nov. 15, at Albion, N. Y.

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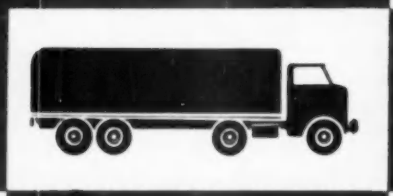

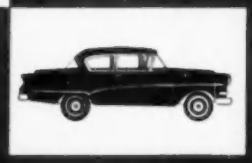

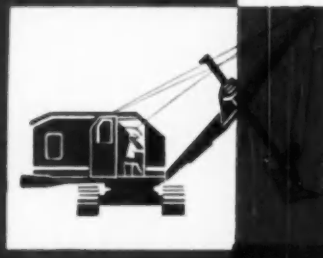

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an Editorial

The INSIDE Story

THE opening of the New Year creates an opportunity for us to clarify our view of those many actions which take place in every plant in this industry, which would be considered virtual miracles of science if performed in any other location. In the automotive industries, it is taken for granted that major advances in technology and engineering can be planned, scheduled and produced without fanfare and often without any publicity whatsoever. The graphic and colorful exposition which is given to the announcement of new passenger cars and trucks, marine and industrial engines, farm equipment, construction equipment and other automotive industry products, is seldom if ever paralleled by the announcement of advances in technical fields.

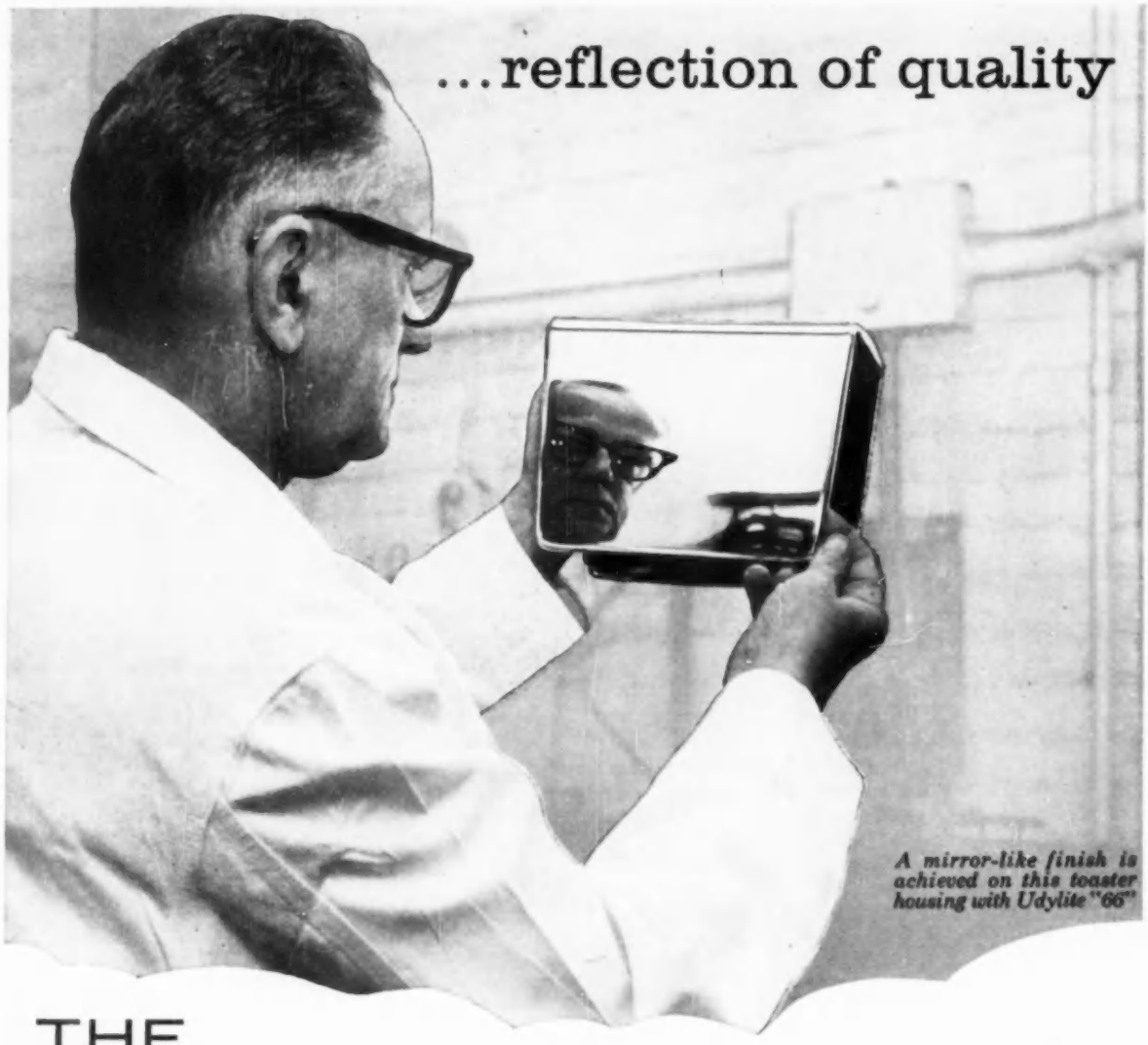
The "inside story" of the industry—in any of its aspects—is more colorful than the appearance of any new model car, no matter how dramatically it is designed. In this issue there is presented, for the first time in one comprehensive article, the "inside" story which tells how members of this industry work together and also work with representatives of other industries. A typical miracle mentioned briefly in this story—is the industry's special work on air pollution reduction. This has involved the development of exhaust control devices for motor vehicles, which is in itself a completely new field of applied engineering. But even beyond this step of originating a whole field of technology, the industry has taken another mammoth stride in the public interest, to speed up development work by pooling the industry's experience and knowledge.

This step in itself is a case history of group action in public service which goes far beyond the usual concepts of the responsibility of manufacturers to the public. It proves most convincingly that this industry places the public need, for scientific advances, on the industry's own regular schedule of problems which must be solved in a program of group progress. There is much more to this "inside story" than can be illustrated by this single example. The broad scale and scope of service to the public interest is represented by all of the technical and engineering programs of the AMA.

This is a profound and significant fact of tremendous importance. I was asked recently by spokesmen of a large Metropolitan Newspaper to explain why the automotive industry would contribute to the social and economic advances of the country. That such a question would be asked, was a great shock to me. These men did not know that this industry is unique. They did not know that this industry places public service before other projects on the schedule of things that must be done every year. They did not know that the reason this industry grows and grows and grows is because it solves the problems for Mr. & Mrs. America which Mr. & Mrs. America can not solve for themselves. And it will solve more problems in 1960, than Mr. & Mrs. America will ever hear about. The public will only know that it gets what it wants. That is why the "National Automobile Show" in Detroit in 1960 is so important. Maybe the public will see more of the "inside story" as new miracles actually unfold, when they see the new cars in the environment in which they are made.

Hartley W Barclay

Editor and Publisher



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When the National Automobile Show opens in Detroit, it will be another cooperative effort of the automotive industry. Planned and executed by committees and staff, the Show will be another evidence of the Automobile Manufacturers Association's program of industry-wide work.

Inside the AMA

A Case Study of Industry Cooperation

In broad terms, the AMA represents the cooperative side of what is unquestionably one of the most competitive and dynamic industries in the world.

The very existence of such a cooperative side comes as a surprise to some people who in their minds associate the industry only with a continuous and titanic struggle for the favor of the new car buyer.

A UNIQUE event of considerable interest and importance to the nation's automotive industries takes place in Detroit next October.

Now being blueprinted and organized by the Automobile Manufacturers Association, this event will carry the long-familiar name —"National Automobile Show."

Scheduled to run from October 15 through October 23, the show will be unique in several respects. For one, it is to be the first time a National Automobile Show has ever been held in Detroit, traditional symbol of America's automotive heartland. Further, it is being planned as the largest, most spectacular exhibition of motor vehicles ever staged. And it will be the first major public event to be held in the mammoth exhibition hall now under construction in Detroit's new civic center.

Named "Cobo Hall" after the late Mayor Albert E. Cobo, this building is a prime reason for the first break from a 60 year tradition. For the century's first four decades the event was held annually in New York at such famous showplaces as the old Madison Square Garden and Grand Central Palace. The shows were the main opening event of each new model season. They

These four Managing Directors encompass most of AMA's history. With Harry A. Williams, currently guiding the Association's work, are William J. Cronin, Alfred Reeves, and George Romney. Only Pyke Johnson's absence keeps this from being a complete picture of AMA's managerial history.

served as annual rallies for the industry and attracted world-wide public attention.

The tradition was revived again in 1956 with the 42nd NAS, lavishly staged at New York's new Coliseum. In the next three years the show was not held, principally because available open dates at the Coliseum were not satisfactory to the industry.

Transfer of the show to Detroit meanwhile appeared to be only a matter of time, a matter of waiting for completion of Detroit's own new showplace.

The National Automobile Show through the years has been the only automotive exhibit sponsored and managed by the motor vehicle manufacturers themselves. Most other automobile shows held in the U. S. are local exhibitions sponsored by dealer associations.

In the year ahead the Show will be a major activity of the Automobile Manufacturers Association—but just one item in a long list of varied interests, ranging from air pollution to ocean shipping rates.

Yet, the fact is that no matter how hotly sales battles may be raging, the members of the motor vehicle producing industry always have been able to get together for cooperative action on common problems, whenever it was in the public interest to do so.

With the AMA organization as a foundation and framework for carrying out such efforts, the industry through the years has conducted many cooperative programs of great value to motor vehicle users and to the Nation generally.

Some of the major areas in which cooperative activities currently are functioning include automotive safety, highway development, engineering standards and air pollution.

The prime objective of such activities is to further the safety, efficiency and enjoyment of motor vehicle transportation.

The National Automobile Show affords a good current example of a cooperative industry program conducted through the AMA organizational structure.

First, the decision to have a show was made by the AMA Board of Directors, composed of the top executive officers of member companies. The Board is the policy setting body and overseer of all AMA activities.

After establishing the show, the Board's first action was to reactivate the Show Committee, a group of top company officials in such fields as advertising, distribution and public relations. This committee is vested with the responsibility and necessary authority to organize and supervise show planning and management. Under the Show Committee, two subgroups also were reactivated—the Exhibits Committee and the Promotion Committee. These are made up of member company representatives in the fields of merchandising display, product promotion and publicity. They report to the Show Committee.

Working with these representative industry committees, the AMA staff, under the managing director, is responsible for executing policies and decisions of the committees and the Board.

Broad in its scope, AMA provides authoritative information about many of the industry's activities. Ranging from releases on development arrived at cooperatively to intriguing booklets, the Association's program of communications is an active and increasingly important part of its program.

Basically, all AMA activities function through similar committee structures created by and reporting to the Directors. On each committee sit representatives of all member companies concerned with the particular activity involved.

Many activities, such as the show, concern virtually all the members.

AMA MAY BE EXPLAINED IN TERMS OF PURPOSES

"Purposes are . . . . . .

"To contribute in the public interest to the successful operation of those engaged in the business of manufacturing passenger cars, commercial cars, trucks, buses and similar self-propelled vehicles, by assisting in the solution of problems affecting the industry and the general public.

"To promote free competition in the manufacture, distribution, sale and servicing of the industry's products.

"To collect and utilize technical and other information regarding the various aspects of the automobile business . . .

"To facilitate the exchange of information among its members regarding inventions, patents, trademarks, processes and devices usable on motor vehicles and in their production and sales . . . . . .

"To acquire and dispose of property, including inventions, letters, patents and processes and rights thereunder . . . . . not for pecuniary profit . . . . . .

Excerpts from
Articles of Incorporation

HIGHLIGHTS OF AMA HISTORY

- 1900 National Association of Automobile Manufacturers
- 1900 National Automobile Show —New York
- 1903 Automobile Show — Chicago
- 1904 Association of Licensed Automobile Manufacturers
- 1905 Engineering Activity (led to formation of SAE)
- 1905 American Motor Car Manufacturers Association
- 1909 AMCMA disbanded; members joined ALAM (except Ford)
- 1910 Good Roads Program
- 1913 Lincoln Highway Asso.
- 1914 National Automobile Chamber of Commerce
- 1915 Patent Cross-Licensing
- 1934 Name changed to Automobile Manufacturers Association
- 1937 Automotive Safety Foundation
- 1939 Standardization Sealed Beam Headlamps
- 1940 Automotive Committee for Air Defense
- 1940 Last Pre-War Auto Show
- 1942 Automotive Council for War Production
- 1946 Golden Jubilee
- 1956 Ford Motor Company Joined
- 1956 National Automobile Show Re-Instituted
- 1956 Uniform License Size Agreement
- 1957 Speed and Horsepower Resolution Adopted
- 1960 First Detroit National Automobile Show

There is, however, a division of activity between the passenger car and the truck producers. Under AMA's Motor Truck Committee and Motor Trust Division lie a variety of programs relevant only to commercial vehicle manufacturers. Likewise some committees concern only the passenger car makers.

AMA's history goes back to the turn of the century when the first National Automobile Show was held in old Madison Square Garden. The present organization, however, was not founded until 1914, under the name of "National Automobile Chamber of Commerce."

In the earlier years several associations of motor vehicle makers were formed. One, the Association of Licensed Automobile Manufacturers (ALAM), represented a group of companies operating under the disputed Selden Patent. When the famous patent was declared inapplicable to the products of the licensees, the ALAM was disbanded and the NACC created.

This early experience with a restrictive key patent led the members of the newly formed association to take steps designed to forestall a recurrence. The result was the historic "Patent-Cross Licensing Agreement," designed to encouraging pooling of basic inventions on which the forward progress of automotive engineering might depend.

The agreement worked effectively and with highly beneficial results during years when the basic design and engineering outlines of the modern motor vehicle were evolving. It also led to the establishment and growth of AMA's extensive Patent Library, which today is an invaluable tool of the industry, both for patent research and as a treasure of historic and technological information. The library is the most extensive collection of automotive literature in the world, containing thousands of historical and technical volumes, photographs, copies of every automotive patent ever issued, bound issues of the important automotive trade journals of many nations through the years, and an unequaled collection of automotive catalogues. The catalogue collection, undoubtedly is the most outstanding asset. It includes sales brochures, owners manuals and similar literature on thousands of

With representative committees at work on 25 major topics, the Association's Detroit headquarters is the automotive center for cooperative research and action. Typical is the Patent Committee, shown at a recent session

makes and models for every year from 1896 on.

When the industry's special work on air pollution reached the point of developing exhaust control devices for motor vehicles—a relatively new "art"—the AMA applied its experience with patent cross-licensing. In the past year, a system was worked out for sharing ideas and developments in this specialized field of exhaust control. The purpose is to speed up experimental and development work on such devices by pooling industry experience and knowledge.

The mechanics of the agreements were worked out jointly by the AMA's Patent Committee and Vehicle Combustion Products Committee—an example of the interdependent nature of many AMA activities. All of the AMA's technical engineering programs illustrate this relationship. They also represent some of the finest case studies of cooperative industry action in the public interest.

An example of the automotive industry's association at work was their meeting with the Governors' Conference Safety Committee. Research facilities and testing operations were highlights of the cooperatively planned program. L. L. Colbert, AMA president, shares an observation with Governors Meyner, Ribicoff, Williams, and Simpson on one of the special tours.

As in the case of the automobile show, AMA technical programs activities fall under the cognizance and supervision of the Board of Directors, advised by a key committee. The committee in this instance is the AMA Engineering Advisory Committee, referred to generally in the industry simply as "the EAC," composed of the top engineers of member companies. Many technical committees, subcommittees, panels and task groups function under its guidance (see accompanying chart).

These subgroups are concerned with areas of vehicle engineering and testing that are basically noncompetitive and in the public domain. They include headlighting, for example, and other matters involving safety or to some degree regulation by public authority.

Through its engineering groups and Field Relations Committee the AMA provides technical assistance to public officials responsible for development or regulation of highway transportation. It regularly meets with groups such as the American Association of Motor Vehicle Administrators or the American Association of State Highway Officials. In 1958, the AMA was host to the Governors Conference Special Committee on Highway Safety for 2½ days of conferences and field trips concerned with vehicle safety activities of the automobile companies.

The Engineering Advisory Committee is composed of the chief engineers of the corporations in the AMA. The subcommittees and special groups consist of top specialists in the pertinent field of activity. In many cases the technical groups work with professional societies, such as the Society of Automotive Engineers (SAE); with specialists from other industries, such as lamp manufacturing or petroleum refining; and with private and Government research agencies often through the Coordinating Research Council.

For many years, headlighting progress has proceeded through AMA cooperative programs, starting on a formal basis in 1935 with a program to develop the first standardized Sealed Beam units

introduced in 1939. Improvements in the Sealed Beam design came in 1954, followed by the dual system in 1957 and further improvement in the seven-inch single unit in 1959.

These successive advances have greatly increased seeing distances on "lower beam" without creating glare to oncoming traffic. Vision through fog, rain or snow has been strikingly improved. Light is more evenly distributed on the road and in a better pattern for maximum vision along the right hand side and shoulder of the roadway.

Considerable work also has been done by the Vehicle Lighting Committee, in conjunction with the Lamp Manufacturers Committee, to increase the effectiveness of taillights and turn signals.

The development of a standardized system of turn signals, incidentally, was a cooperative effort of the AMA lighting groups. It was also through AMA committees and the Board that the industry established the policy of installing turn signals on all new automobiles.

A member of the Vehicle Lighting Committee said recently in a presentation to the Highway Research Board:

"The industry has not limited the scope of its activities only to improving the present headlighting system. It has broadened its research activities and scanned new developments in science which may offer possibilities to a better approach to the basic problem."

A highly active cooperative engineering program has been underway for the past six years in the field of engine exhaust, relating to special air pollution problems of West Coast urban areas. Research in these areas has indicated "photochemical smog" is formed when certain meteorological and climatic conditions permit airborne pollutants to react chemically in the atmosphere. Taking part in this reaction are organic compounds or hydrocarbons produced by incomplete combustion or evaporation of petroleum products. In areas of heavy motor vehicle traffic, automotive exhaust is a major contributor of these hydrocarbons in the atmosphere and to a less extent

RESEARCH

Above—Resources both current and historic are found in the collections of the AMA library. Periodicals are read and indexed, searches of many types are conducted, and a constant flow of information is channeled to members.

LIBRARY

Right — Facilities are also available for qualified researchers. Many books about the industry and its products credit the library as a major source.

Statistics of all sorts become meaningful in AMA's basic publications, "Automobile Facts and Figures," and its companion, "Motor Truck Facts." Widely used in the industry, they are equally prized by educators, journalists, government agencies, and researchers.

AMA ORGANIZATION

BOARD OF DIRECTORS
and Officers

L. L. Colbert, President — **J. N. Bauman, Vice President**
Henry Ford II, Vice President — **John F. Gordon, Secretary**
W. C. Schumacher, Treasurer

COMMITTEES

The following are major standing committees of the AMA and their current chairmen. A number of technical panels and task groups have been omitted because of space limitations.

AASHO Road Test Committee
Ira E. Johnson
Plant Engineer—Proving Grounds
Chrysler Corporation

Controllers Committee
Erwin H. Graham, Comptroller
Chrysler Corporation

Contact Terminations Committee
Jack B. Baldwin, Assistant
Defense Contract Administrator
Defense Operations Division
Chrysler Corporation

Procurement and Renegotiation Committee
Frank S. Kipp, Manager
Defense Contract
Administration Department
Ford Motor Company

Engineering Advisory Committee
Paul C. Ackerman, Vice President
Engineering
Chrysler Corporation

Advisory Group on Industrial Wastes and Water Resources
Frank Kallin, Chief Civil Engineer
Plant Engineering Office
Ford Motor Company

Committee on AMA Consolidated Specifications Form
J. T. Jurgenson, Supervisor
Product Information Section
Ford Motor Company

International Standards Liaison Committee
Harry C. Doane, Assistant
to Vice President, Engineering
General Motors Corporation

Vehicle Combustion Products Committee
Charles M. Heinen
Assistant Chief Engineer
Chemical Engineering Department
Chrysler Corporation

Vehicle Identification Numbers Committee
Roy P. Trowbridge
Engineering Standards
General Motors Corporation

Vehicle Lighting Committee
L. L. Beltz, Chief Engineer
Product Engineering Office
Hardware & Accessories Group
Ford Motor Company

Vehicle Safety Committee
Alex L. Haynes, Director
Engineering Research and
Advanced Product Study
Ford Motor Company

Export Committee
*Jess C. Delaplain
Senior Vice President
Willys Overland Export Corporation

Field Relations Committee
S. M. DuBrul
Executive Business Research Staff
General Motors Corporation

Committee on Vehicle Regulation
Robert O. Sornson, Manager
State Affairs
Chrysler Corporation

Government Reports and Surveys Committee
Rod L. Wilson
Coordinator of Government Reports
Chrysler Corporation

Highway Economics Committee
George Russell
Executive Vice President
General Motors Corporation

Research Committee
George P. Hitchings, Manager
Economic Analysis Department
Ford Motor Company

Investment Committee
Walter J. Simons
Treasurer
Chrysler Corporation

Manufacturers Committee
*John S. Bugas
Vice President
Ford Motor Company

Materials, Controls & Allocations Committee
William J. Jones, Director
Central Production
Control Operations
Chrysler Corporation

Motor Truck Committee
E. J. Bush, Chairman
Diamond T Motor Truck Company

Truck Technical Committee
M. Thomas Hayes
Assistant Truck Engineer
Administration
GMC Truck & Coach Division
General Motors Corporation

Joint AMA-TTMA Technical Committee on Combination Vehicle Brakes
A. F. Stamm, Staff Engineer
Chassis
Chrysler Corporation

School Bus Technical Committee
Milton R. Liechty
Sales Engineering Consultant
International Harvester Company

Motor Truck Public Relations Committee
Bernard W. Crandell, Director
Public Relations
GMC Truck & Coach Division
General Motors Corporation

National Automobile Show Committee
Charles L. Jacobson, Vice President
Chrysler Corporation

Promotion Committee
William E. Hamilton,
Staff Coordinator
Public Relations
General Motors Corporation

*Election of new chairman pending

ON CHART

Exhibits Committee
L. E. Kiefer
Styling Section
General Motors Corporation

Ocean Rate Committee
Terence J. Gilsenan
Director—Traffic
General Motors Overseas Operation
General Motors Corporation

Patent Committee
Paul O. Pippel
General Patent Attorney
International Harvester Company

Public Relations Committee
Charles F. Moore, Jr., Vice President
Advertising and Public Relations
Ford Motor Company

Education Committee
Michael Radock, Manager
Educational Affairs
Ford Motor Company

Service Managers Committee
P. B. Hopkins, Director
Service Development and Training
Chrysler Corporation

Taxation Committee
Frank V. Olds, Assistant Comptroller
Administration
Chrysler Corporation

Traffic Committee
Edward K. Martin
Traffic Manager
Willys Motors, Inc.

Rate Committee
Donald E. Burnham, Supervisor
Rates and Classifications
Ford Motor Company

Managing Director's Office
Perry L. TeWalt, Assistant to Managing Director
Christy Borth, Assistant to Managing Director

Engineering and Technical Department
William F. Sherman, Manager

Export Department
George R. Curtis, Manager

Field Services Department
Karl M. Richards, Manager

General Services Department
Vincent Kilbildis, Manager

Manufacturers Department
William Hotchkiss, Manager

Motor Truck Department
John H. King, Manager

Patent Department
William L. Scherer, Manager

Statistical Department
Stanley S. Roe, Manager

Traffic Department
Carman E. Brown, Manager

New York Office—Ocean Rate Department
Frank J. Mahoney, Manager

Washington Office
Harlan V. Hadley, Manager

of oxides of nitrogen, also considered a factor in the smog reaction.

To seek ways of controlling or eliminating such exhaust emissions, the AMA Engineering Advisory Committee established the Vehicle Combustion Products Subcommittee, popularly known as "the smog committee."

Following a virtually uncharged route, developing new techniques and instrumentation as it went along, the VCP subcommittee put into motion an intensive industry-wide research program. Several experimental devices have been developed. Three types designed for oxidation of exhaust emissions are currently under intensive development and test. Last month, the AMA announced that a control for emissions coming from crankcase "blowby" will be installed on all cars built for sale in California no later than the start of 1961 model production.

One of the special ways in which AMA serves its members and the public is by the collection and distribution of significant statistical information on the automotive industry and highway transportation in general. The statistical staff of the association provides this vital information. In addition to statistical bulletins provided AMA members, it produces two widely used statistical handbooks, "Automobile Facts and Figures" and "Motor Truck Facts."

To make full use of the vast AMA storehouse of statistical, historical, technical and photographic material on automotive subjects, a full program of information services is conducted by the Public Relations Department. News releases and information publications are produced and distributed to news media and the public.

Another phase of this activity is Educational Services, which provides materials on automotive subjects to schools.

The Field Services Department provides liaison and reporting services for the member companies on matters of vehicle regulation and legislation by state and local governments. Field representatives keep in touch with developments in 50 states that concern any facet of highway transportation. Legislative actions are analyzed, digested and reported to the members.

As with all AMA activities, these likewise are carried out under the guidance of committees. The Public Relations Committee, composed of public relations directors of member passenger car companies, oversees the information program

Teachers, professors, and students annually ask for thousands of educational aids. Typical of those prepared are these maps, bulletin board kits, authoritative curriculum guides, and basic pamphlets. In addition, two feature films and a number of filmstrips help to tell the industry story.

and makes public relations recommendations to the Board. Under it, a committee of company educational directors guides the educational services program. The Field Services Committee, and its Subcommittee on Vehicle Regulation function similarly in matters concerning government relations. The AMA's Washington office reports on developments of interest at the Federal level.

Among the many motor truck activities of the AMA also is a technical program carried on by the Motor Truck Technical Committee and the Joint AMA-TTMA Technical Committee on Combination Vehicle Brakes.

The Motor Truck Public Relations Committee, representing the truck manufacturers, carries out special truck public information programs through the public relations staff.

The full list of AMA committees and activities is too long to cover even briefly in an article of this length. Among other activities not yet mentioned are the Traffic and Ocean Rate Committees, concerned with freight shipping costs and methods. An Export Committee studies the industry's position in foreign markets. The Patent and Service Managers Committees function in the special fields indicated by their names. A specially fruitful program of the Service Managers group has been cooperating with vocational schools to improve the quality and effectiveness of automotive mechanic training.

Through most of its history, the AMA has been vitally concerned

Advantages of a uniform license plate size led to a long campaign resulting in today's standard measurements. Representative of the Association's study, research, and action programs, the campaign was the concerted effort of several operating committees, with the public and the industry benefiting from the uniformity.

Contemporary materials for both member and staff use are a valuable part of the AMA's research activity. In this collection the broad emphasis is on economic and social history, combined with current affairs. The material is useful in conducting many cooperative programs of value to motor vehicle users.

AMA BOARD OF DIRECTORS

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American Motors Corp.

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Henry Ford II—Vice President
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John F. Gordon—Secretary
W. C. Schumacher—Treasurer

HARRY A. WILLIAMS
Managing Director, AMA

The industry's emphasis on engineering research and development makes the exchange of information on technical matters a highly important part of AMA's staff work. Many special "task forces" and study groups carry on correlated research and share the findings.

Field research by special AMA committees produces vital information available to manufacturers and to suppliers. Using the latest techniques, with no competitive motive except improvement, such activities have made major contributions to today's motor vehicles.

with highway safety and improvement. A Vehicle Safety Committee functions continually under the Engineering Advisory Committee. In 1937, the AMA was instrumental in establishing the Automotive Safety Foundation in Washington, and has continued to provide about half of its yearly endowment. The Public Relations Committee a year ago instituted a special AMA information program concerned with automotive safety activities.

The industry, largely through the AMA, has supported the good roads movement in the U. S. for decades. The AMA and the Automotive Safety Foundation strongly backed the extensive Federal Highway modernization program adopted by Congress in 1956.

It is with the subject of highway development that the newest AMA committee concerns itself. The group, called the "Highway Economics Committee," was created only a few weeks ago by the Board of Directors to advise on highway matters. It is a high level committee of company officers that will begin its activity with quiet research. But its hope and aim for the future is to increase the AMA's contribution to the cause of safe highways, economically built, properly planned, of adequate traffic capacity, and at the lowest possible cost to the public. ■

Trucks, both as a product and as a major factor in transportation, are of prime interest to AMA's members. As a center both for information and the creation of policy, the several motor truck committees conduct extensive cooperative programs.

Making news of AMA's many programs is not difficult. With a wealth of statistics and historic resources added to the everyday activities, press materials of broad interest are created. In this way, the Association aids in interpreting the industry to the public.

Machine Tool Builders Have Bright Outlook for 1960

AI SURVEY of Machine Tool Builders, Backed Up by Major Modernization and Expansion Programs in the Automotive Industry, Points to Substantial Sales of Machines During 1960

By Charles A. Weinert
EASTERN EDITOR

FOR the first time since 1956, major modernization and expansion programs in the automotive industry are leading a significant upturn in the deliveries and sales of the machine tool industry. The volume is large, but details cannot be revealed in this report of machine tool trends. However, as the figures are disclosed month by month in 1st Half reports of machine tool shipments and orders, we predict they will show that the solid backbone of this new business for the machine tool builders will remain strong regardless of the steel strike situation.

As further evidence of the trend, but not necessarily agreeing with the above statements in full—the U. S. Department of Commerce, early in December, predicted that expenditures by U. S. manufacturers for new plant and equipment during the 1st Quarter 1960 will be at an annual rate of $34.4 billion.

This volume, if it materializes, will exceed estimated 1959 capital expenditures, on an annual basis, by about $1.8 billion — and be second only to 1957's record high of almost $37 billion. The Department of Commerce report also indicates that makers of motor vehicles and other transportation equipment, as well as iron and steel manufacturers, will be leaders in increased capital spending.

Builders Surveyed

With the background just mentioned—what do the machine tool builders themselves think about the business situation? How do they stand with respect to orders on the books? Is the outlook for 1960, in their views, as good as the above forecasts might indicate?

What about the steel strike? Are deliveries of machine tools apt to be extended? What suggestions do the machine tool builders have for their automotive customers?

These were the major questions which seemed to require answers if the current business trends and the outlook for the machine tool industry were to be thoroughly evaluated—as well as the factors which could influence automotive purchasers of machine tools.

To get the answers, AI editors contacted top executives in the machine tool industry. About 100 major producers of metal-cutting and metal-forming machine tools were represented by this group. At press time, a number of the replies were not in—but the viewpoints received by the deadline date were sufficient to clearly indicate the thinking within the industry.

Although the industry's responses are highly optimistic, recent plant visits of AI editors convinced them that even the most optimistic reports do not fully reflect the total size and activity of machine tool buying programs in the automotive industry. Be that as it may, here are the data and viewpoints most-cooperatively supplied by the builders:

Order Backlogs Up

On the whole, order backlogs are substantially up compared to a year ago. The *increases* do, however, vary widely among companies — ranging anywhere from 14 to 300 per cent. For all the companies reporting, the *average* order backlog upswing is 96 per cent.

Inquiry activity likewise is up, compared to a year ago, but to a lesser degree. While one company reported increased inquiry activity of as much as 300 per cent, the majority fell in the range of 10 to 25 per cent. The *average increase* for inquiry activity among all the companies reporting is 40 per cent.

Most of the respondents felt the steel strike had adversely affected their recent orders, as well as inquiries.

On one point, the machine tool builders are essentially unanimous. And that has to do with the possible effect of a resumed steel strike, if it should occur late in January. The majority feels such an occurrence would be "a major catastrophe," "cause major disturbances," and "have a sobering effect on new business."

Outlook for 1st Half

Almost all of the builders say business should be up in the 1st Half of 1960 compared to 2nd Half 1959—and most of them predict an increase on the order of 10 to 25 per cent. One builder forecasts a

50 per cent increase. However, their forecasts generally are based on a settlement of the steel strike.

Deliveries of machine tools, in the case of a few companies, are extended slightly over those in effect in September, 1959. As to mid-1960, most companies predict longer deliveries — ranging from moderately longer to as much as 50 per cent longer than at present. No overall criteria is evident—so our recommendation here is that you check with your individual suppliers on any anticipated purchases.

Typical replies to the specific questions which were submitted to the builders for comment are presented in the following. Their comments are quite interesting and informative from several standpoints, aside from the figures stated.

Present Sales Picture

Question: Is the volume of your *order backlog* now greater than a year ago? Volume of *incoming inquiries* also greater?

Joseph Buhr, president, Buhr Machine Tool Co. — "The volume of our order backlog is now greater than a year ago. Present backlog is 300 per cent of last year's. The volume of our incoming inquiries is now greater than a year ago. Present rate is 200 per cent of last year's."

J. R. Barefoot, president, The Federal Machine & Welder Co.— "At the present time our order backlog is four times greater than it was a year ago. The volume of our incoming inquiries is also approximately four times what it was a year ago."

Louis Polk, president, Sheffield Corp. — "Backlog of 20 per cent over a year ago; incoming inquiries same as a year ago."

Don S. Connor, president, Micromatic Hone Corp.—"Our backlog now is 20 per cent greater than one year ago. Incoming inquiries are currently 60 per cent over one year ago."

H. G. Bixby, president, Ex-Cell-O Corp.—"Our order backlog is approximately 38 per cent higher than on December 1, 1958. Our volume of incoming inquiries had been at a higher level until the month of November. Beginning with November we noticed a sharp decline in inquiries which we attribute to the effect of the steel strike."

Ralph E. Cross, executive vice president, The Cross Co. — "Our order backlog is 60 per cent higher than it was a year ago. Inquiries and proposals submitted to potential customers for 1959 are running about 30 to 35 per cent more than 1958."

First Half 1960 Sales

Question: What is your forecast for new business receipts in 1st Half 1960 compared to 2nd Half 1959?

R. W. Banfield, president, The Motch & Merryweather Machinery Co.—"We forecast that our new business receipts for the first half of 1960 will be 50 per cent more than the second half of 1959."

George Gorton III, president, George Gorton Machine Co.—"Assuming the steel strike is settled, our forecast for new business in the first half of 1960 is 20 per cent over the second half of 1959."

Lyman H. Bellows, vice president-sales, Sheldon Machine Co., Inc.—"We are looking forward to a 20 per cent increase in incoming orders for 1960 and are planning on that basis."

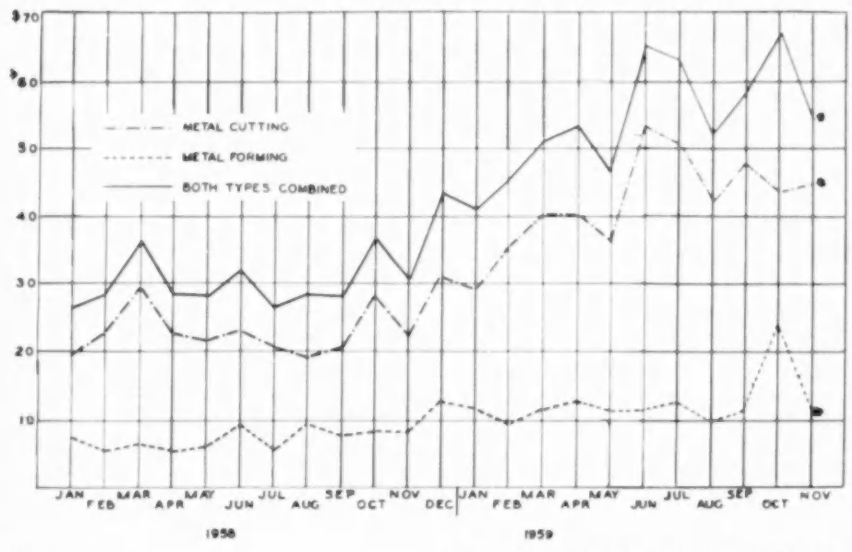
E. M. Hicks, vice president, Norton Co. — "Our forecast for new business receipts in the 1st half 1960 is 11 per cent greater as compared to the 2nd half 1959."

H. H. Whitmore, executive vice president, Jones & Lamson Machine Co.—"Assuming there is no steel strike when the cooling-off period ends in January, we anticipate a 23 per cent increase in new orders for the first half of 1960 versus the second half of 1959."

Roland Lehr, president, Baker Brothers, Inc. — "Barring a renewed strike in the steel industry, we are anticipating an increase of new orders in the first half of 1960 of approximately 30 per cent over the second half of 1959."

N. M. Forsythe, president, National Automatic Tool Co., Inc.— "We would expect new business during the first six months of 1960 to be about double for the same period of last year."

METAL CUTTING AND FORMING MACHINE TOOLS
Net New Order Receipts—By Months
(Millions of Dollars)



*Preliminary

Source: National Machine Tool Builders' Assn.

Automotive Business

Question: Have you already received, or do you anticipate placement by the automotive companies of sizable orders for machine tools—arising from expansion of production facilities, particularly as a result of the apparent success of the new compact cars? If so, to what extent has this factor affected your business picture or outlook?

J. R. Barefoot, president, The Federal Machine and Welder Co. — "We have already received some rather substantial automotive orders for mechanical presses. The effect this has had on our business picture is to give us a better working backlog. However, we are currently receiving orders from other industries which, in our opinion, is a healthy trend."

Louis Polk, president, Sheffield Corp.—"Expect increase, but not revolutionary, in automotive orders for machine tools."

H. H. Whitmore, executive vice president, Jones & Lamson Machine Co. — "We have received some new orders from the automotive industry and many attractive inquiries. If a reasonable proportion of the inquiries received turn into orders, our anticipated increase in new business could rise by another five per cent."

Frederick S. Blackall, Jr., president and treasurer, The Taft-Peirce Manufacturing Co. — "We should anticipate considerable forward buying of machine tools, gaging equipment, and other aids to manufacture by the automotive industry as soon as the present uncertainties are resolved."

Roland Lehr, president, Baker Brothers, Inc.—"We have already received orders from the automotive companies for expansion, and anticipate more. Fifteen to 20 per cent of our increase next year should come from this source."

Ralph E. Cross, executive vice president, The Cross Co. — "We have already received orders to duplicate some of the equipment that we have made for the compact cars, and we are expecting more duplications during 1960."

Howard N. Maynard, president, Snyder Corp. — "We think that there will be more business resulting from increased capacity requirements for the compact cars. Sizable orders for machine tools for the compact cars were placed about a year ago."

Delivery Situation

Question: What kind of deliveries can you now make on new machine tool business—and are deliveries being extended from those offered say in September, 1959? Are deliveries apt to run longer on orders placed at mid-1960?

Joseph Buhr, president, Buhr Machine Tool Co.—"We are now making six months' delivery on new machine tool business, which is extended from the delivery offered in September, 1959. We do not feel that deliveries will run longer than this on orders placed in mid-1960."

E. M. Hicks, vice president, Norton Co. — "Deliveries quoted thus far continue to be normal, but if our expectations for new business in 1960 are fully realized or exceeded, there will undoubtedly be a moderate lengthening of deliveries."

Frank J. Fields, president and general manager, The Fosdick Machine Tool Co.—"Our delivery schedule at the present time is approximately five months and is longer than those offered in September of 1959. We definitely believe that deliveries will be extended on orders placed in mid-1960."

Don S. Connor, president, Micromatic Hone Corp. — "Depending on the type of equipment, our deliveries are now on an 8 to 26 week delivery, about the same as last September. Based on our projections, deliveries would be extended probably 25 to 50 per cent longer."

Recommendations

Question: Do you have any personal recommendations which could be passed on to the automotive industry — in the way of factors to be considered when planning for tool modernization during the next 12 months?

G. M. Stickell, president & general manager, Landis Machine Co. —"In my opinion the outstanding development in tool modernization for the automotive industry has been in the so-called "Chipless Machining." Form and thread rolling machines are available from several sources for the production of small gears, splines and threaded parts used extensively in the industry, and equipment of this type has an enormous potential in cost reduction."

J. P. Crosby, vice president-sales, The Lapointe Machine Tool Co.—"We feel that members of the automotive industry are wasting money in the retooling of obsolete machines, for they are not getting the production that they could have with the improved machine tools being manufactured today, especially broaching machines that have had the greatest productivity of all machine tools.

Howard N. Maynard, president, Snyder Corp.—"If the automotive industry would freeze its product design and processing procedures prior to the placement of orders for machine tools, the result would be shorter delivery, better machines, and lower prices."

Frederick S. Blackall, Jr., president and treasurer, The Taft-Peirce Manufacturing Co.—"Automobile manufacturers would certainly be acting in their own interests, as well as those of industry at large, by anticipating their requirements for the next 12 months at the earliest possible date. The longer procurement is deferred, the more likely it is that orders will snowball into an avalanche one of these days, with inevitable stretching out of deliveries and increase in costs." ■

The foregoing is an abbreviated version of a comprehensive report. Copy of the complete report, which contains additional comments from the machine tool builders, is available upon written request addressed to the Editor, AUTOMOTIVE INDUSTRIES, 56th & Chestnut Sts., Philadelphia 39, Pa.

New Horizons in METAL FINISHING

By
Andrew W. Shearer
MARKET RESEARCH EDITOR

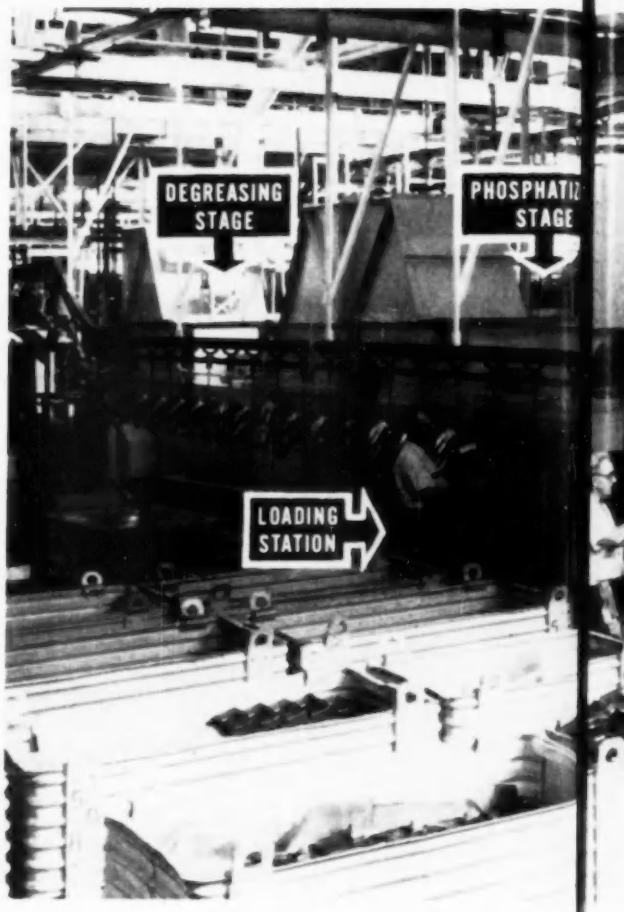


Fig. 1—Phosphatizing unit on Corvair engine line at Chevrolet Tonawanda (N. Y.) plant is sandwiched between degreasing and painting stages of integrated metal finishing system based on trichloroethylene. Compact equipment is completely hooded to insure economical operation.

Three-Stage System at Chevrolet Tonawanda (N.Y.) Plant Combines Cleaning, Phosphatizing, and Painting in Single Compact Machine

FINISHING time on many steel engine parts for the 1960 Corvair engine has been slashed by 50 per cent at the Chevrolet Tonawanda (N. Y.) plant. Key to this significant "break-through" in metal finishing is the 65-ft hooded and conveyorized unit shown in Fig. 1. Based on a single solvent (trichloroethylene), it combines vapor degreasing, phosphatizing, and painting in one fully integrated and continuous operation.

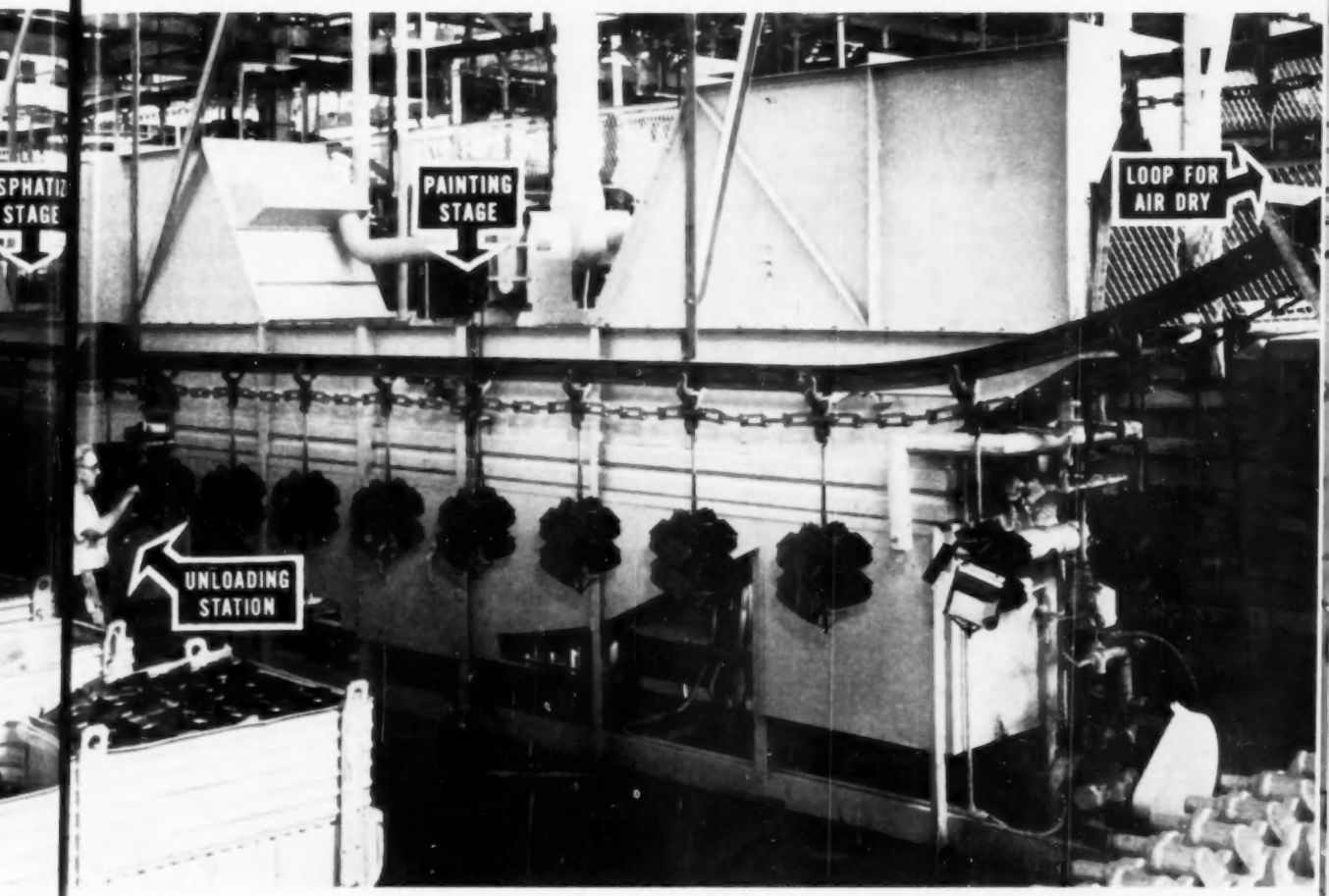
The unique three-stage system was developed by the Electrochemicals Department of the Du Pont Co. Equipment and engineering aid was supplied by G. S. Blakeslee & Co.

The Tonowanda setup is the first full-scale unit of its type to be installed by a U. S. manufacturer and is part of an extensive field evaluation program.

A "THREE-IN-ONE" SYSTEM

Here is a thumbnail description of the three-stage finishing unit at the Tonawanda plant. *Stage One* is standard vapor degreasing based on trichloroethylene. *Stage Three* involves dip painting using nonflammable trichloroethylene as the thinner. Operation at close to boiling temperature causes the thinner to "flash-evaporate" as soon as the parts leave the paint, and it is recovered for further use. There is no need for a messy drip area, and the dangers of flammable solvents are eliminated.

Stage Two is a new "dry" phosphatizing process also based on trichloroethylene. It is the magic element that links together trichloroethylene vapor degreasing and painting to form a complete finishing system. As a result, racks of engine parts such as mounting brackets, pulleys, shrouds, etc., move through the three-stage finishing unit in 15 min vs. 30 min or more with alternate systems. A 700-gal phosphatizer applies a thin, yet critical, phosphate coating to the steel parts that improves paint adhesion and corrosion resistance.



Multiple Savings

Meaningful test data on the Tonawanda installation are not yet available, primarily because of a plant shutdown resulting from the steel strike. Early reports, however, indicated that the system was more than living up to expectations.

Appreciable savings have already been realized in equipment outlays and floor space.

The figures shown in Table I—a cost study on chassis parts—indicate clearly that the automobile industry is one of the most attractive areas of application for "Triclene" (Du Pont trade name) trichloroethylene metal finishing. Already in operation are several large painting units processing headlamps, transmission castings, chassis, and suspension parts, in addition to the complete degreasing-phosphatizing-painting unit for en-

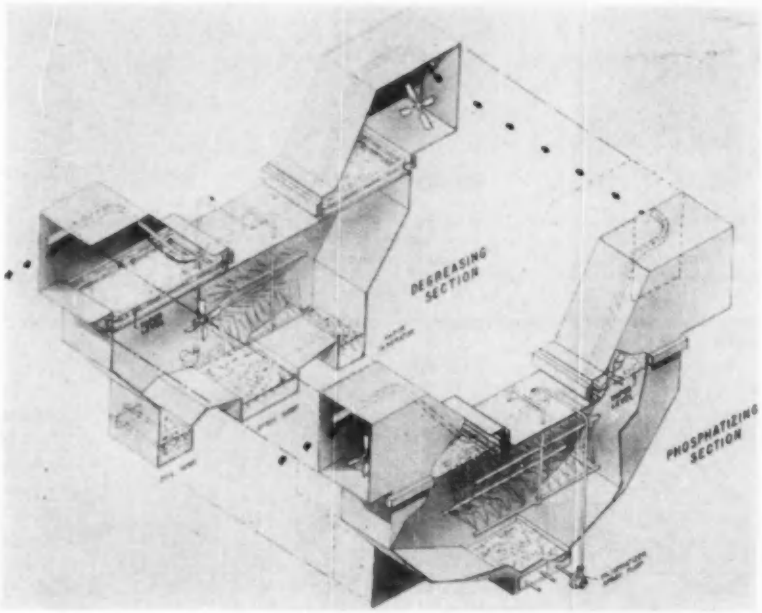


Fig. 2—U-Bend Degreaser-Phosphatizer. After thorough cleaning in degreasing section, parts receive dry phosphate coating. They emerge completely dry from phosphatizing section all ready for final painting.

gine parts at the Chevrolet Tonawanda (N. Y.) plant.

The workload is 2400 parts per hour in the study. There are three different parts involved which average three lb each and have two sq ft of surface area (both sides). In the "Triclene" system, these will be racked eight per rack to give 300 racks per hr and a line speed of 10 fpm. With a conventional system for dip painting, it is not possible to rack parts one above another because the paint dripping would spoil the appearance. Parts are racked four per rack, and the line speed is 20 fpm. Both systems will operate for 2000 hr per year.

The "Triclene" finishing system consists of a vapor-spray-vapor degreaser, dip phosphatizer, and dip painter. The system applies a one mil coat of black, air-curing paint. There is no dripping after the parts leave the dip tank, and the parts are cool and sufficiently dry to unload and pack in about 10 min. The entire machine would be roughly 90 ft long and have another 100 ft of overhead cooling and drying loop.

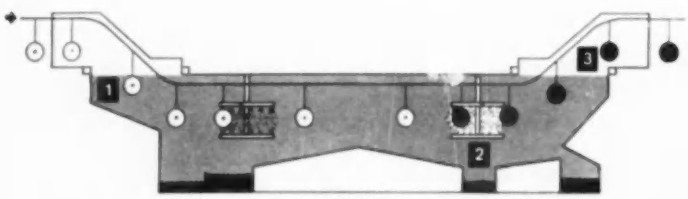
A conventional system to do the same job could be a four-stage washer - phosphatizer, a dry - off oven, a cooling section, a dip painter, a drip area, and a small oven to evaporate the remaining thinner. The cleaning, phosphatizing, and dry-off would run 125 ft, and the cooling, painting, dripping, and thinner evaporation another 180 ft. In addition, an overhead section of about 150 ft would be required for cooling and additional curing of the paint before unloading the parts.

"DRY" PHOSPHATIZING

The advantages of cleaning by vapor degreasing, such as excellent solvency for oils and greases and the production of dry parts ready for immediate processing, are well-known. The method has been widely adopted in the metal finishing field for numerous cleaning operations.

In addition to cleaning metal surfaces thoroughly, however, it is becoming increasingly desirable to apply phosphate coatings to obtain improved paint bonding and corrosion resistance. Up until recently, no practical method was available for applying a phosphate coating from other than an aqueous solution. Common industrial practice has been to precede aqueous phosphatizing operations with water-based cleaning.

There has long been a need for an improved "dry" process which would extend the advantages of vapor degreasing to include a phosphatized coating. For a number of years, the achievement of this goal has commanded the attention of researchers at the Du Pont Chestnut



DU PONT "TRICLENE" FINISHING SYSTEMS

No. I
No. II
No. III

Fig. 3—Du Pont "Triclene" Finishing System No. I (Integrated Vapor Degreasing and Nonflammable Painting): 1) Soiled metal part is cleaned by trichloroethylene vapor-spray-vapor degreasing; 2) Paint, thinned by trichloroethylene, is applied to part by Spray-In-Vapor method; dip painting is also available; 3) Excess solvent quickly evaporates as hot, painted part emerges from unit completely dry (when lacquers are used). In the case of curing paints, it is ready for a short baking step.

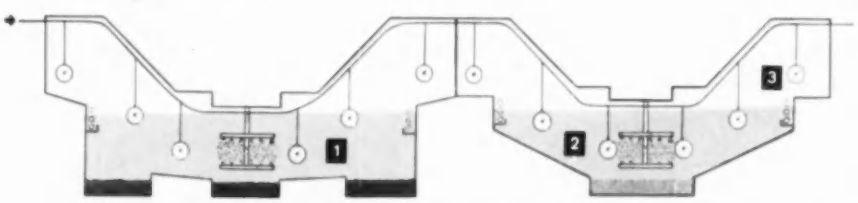


Fig. 4—Du Pont "Triclene" Finishing System No. II (Vapor Degreasing and Phosphatizing): 1) Part is cleaned by trichloroethylene vapor-spray-vapor degreasing; 2) treated in "dry" phosphatizing composition; 3) Solvent evaporates as part emerges from trichloroethylene vapor, so it is dry and ready for painting, storage or shipping.

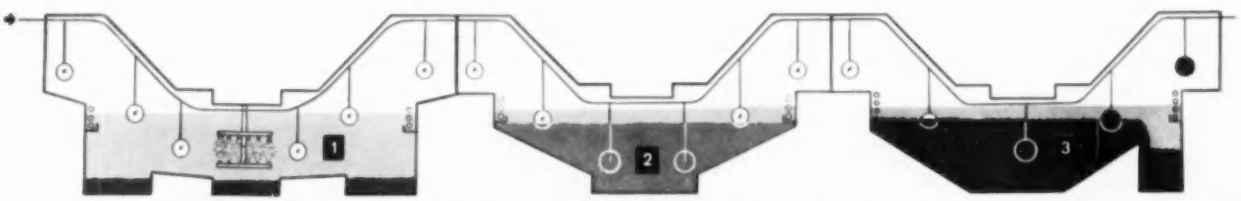


Fig. 5—Du Pont "Triclene" Finishing System No. III (Vapor Degreasing, Phosphatizing and Painting): 1) Part is cleaned by trichloroethylene vapor-spray-vapor degreasing; 2) phosphatized during one short immersion in solution; 3) dip-painted with trichloroethylene-thinned paint; Spray-In-Vapor painting, not shown, is also available.

Run Laboratories, Wilmington, Del. Late in 1958, their efforts were crowned with success in the development of a workable laboratory unit.

After the initial laboratory victory, the new phosphatizing process underwent preliminary field trials at several locations during 1959. One of these is the intermediate stage in the all-trichloroethylene finishing system at the Chevrolet Tonawanda plant. The satisfactory results achieved with this and other installations have led Du Pont to expand its development program to cover more metalworking applications with full commercialization projected for mid-1960.

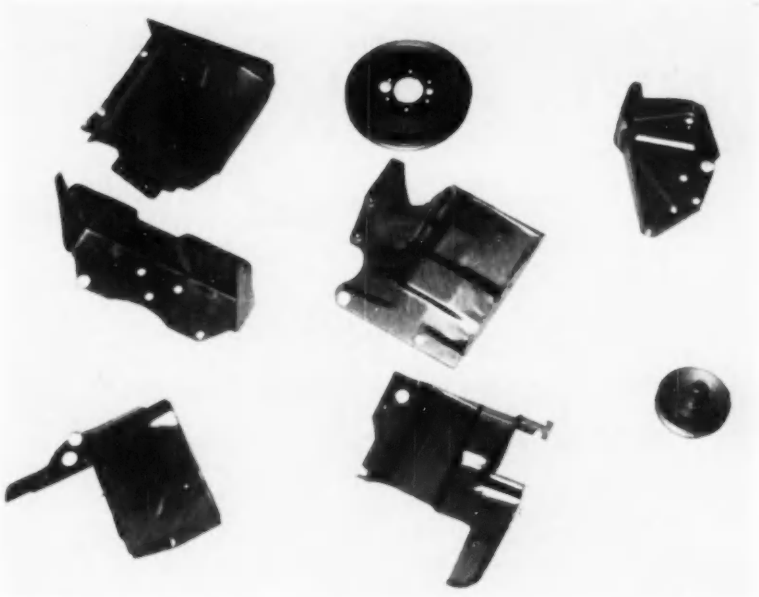
How Process Works

The phosphate coating is produced by treating the cleaned metal with a combination of phosphatizing chemicals dissolved in trichloroethylene. As in a vapor degreaser, the trichloroethylene-based phosphatizing solution is operated at the boiling point of the solvent (188F) so that a tricholoroethylene vapor zone exists over the solution.

The phosphatizing solution may be applied by either spraying or dipping; parts dry immediately as they emerge from the vapor zone. In general, vapor degreasing will precede phosphatizing, so when the parts enter the phosphatizer, they will be dry, clean, and hot.

The solution reacts with the steel surface, converting it to a strongly-adherent form of iron phosphate which provides an excellent base for subsequent painting. Reaction rates are rapid; coating weights from 40 mg/sq ft to over 200 mg/sq ft can be achieved in 30 sec to 3 min. The process can also be used to apply phosphate coatings on aluminum and on zinc surfaces such as die castings and galvanized steel.

Control of the bath composition presents no problems. Simple tests such as specific gravity measurement and a single endpoint titration are all that is required.



Typical steel parts that travel through three-stage finishing system at Chevrolet Tonawanda (N.Y.) plant are mounting brackets, pulleys, shrouds, and similar items.

Major Advantages

Principal advantage of the new phosphatizing process lies, of course, in the fact that the parts

(*Turn to page 77, please*)

TABLE I

COST STUDY

(Automobile Chassis Parts)

Hourly Operating Costs

COST COMPARISONS	"Triclene" System	Conventional Method
Solvent, chemicals, paint and thinner	$23.50	$22.20
Utilities	1.70	12:30
Labor	15.20	16.00
Investment Carrying Cost	9.80	19.00
All other costs (including maintenance, depreciation, insurance	9.20	13.60
Total	$59.40	$83.10
Total Cost per 1000 sq ft	$1.23	$1.75
Cost reduction	28%	
Floor Space Req'd.—sq ft	720	2400
Space savings	70%	

INVESTMENT REQUIRED	"Triclene"	Conventional
Equipment (Installed)	$50,000	$75,000
Utilities (Allocated)	6,000	44,000
Floor Space	8,400	25,000
Working Capital	34,000	46,000
	$98,400	$190,000

DUCTILE IRON . . .

Today and Tomorrow

Promising Automotive Future Seen for Family of Materials Linking Together Advantages of Both Cast Iron and Steel

By W. H. Dawson
Ductile Iron Division
The International Nickel Co., Inc.

Hollow ductile iron crankshaft for a German passenger car. Ductile iron's excellent castability enabled the manufacturer to improve the design and cast closer to required dimensions with a resultant saving in machining.

DUCTILE iron is used in a variety of automotive parts. These range from door lock components to crankshafts and from rocker arms to rear spring mounting supports. Applications extend from parts weighing a few ounces to those running into hundreds of pounds.

This paper is divided into three parts. The first part is a brief discussion of major ductile iron components in the power plant and chassis. The second section is a brief review of the use of ductile

Rear axle housing of ductile iron for heavy-duty truck.

Wheel center and brake drum of ductile iron for passenger car.

Gear case, front spring bracket, sprocket wheel, radiator bracket, and brake shoes cast of ductile iron.

iron in the automotive die field. The third part deals with the future of ductile iron.

Engine Uses

The largest single application of ductile iron in the automotive field, not in terms of size but certainly of tonnage, is the crankshaft. In this country, the Ford Motor Co. uses precision cast ductile iron crankshafts.

The engineering property that is perhaps the most outstanding in a ductile iron crankshaft is its resistance to wear. This characteristic is due to the self-lubricating property of graphite on the bearing surface. In addition, it has high fatigue and tensile strength, damping capacity, and a good degree of elongation. These qualities, in turn, allow efficient distribution of weight and improved balance consistency.

European practice has produced a crankshaft that is hollow. The section modulus is improved; weight is saved; and stresses developed during high speed rotation are reduced. I refer to the crankshaft presently used in the German Ford Taunus.

This crankshaft has a wall thickness of $\frac{3}{8}$ in. and incorporates small diameter tubes which form oil channels for lubrication of the piston rod bearings. These steel tubes are cast in when the crankshaft is poured; therefore, the drilling of the oil holes is eliminated.

In both of these instances, the utilization of ductile iron was dictated by the engineering properties attainable and the reduced cost both in the foundry and the machine shop. The Ford (U. S.) crankshaft is presently made with increased precision of the casting. This has reduced weight of the finish stock from 9.5 lb in the previous casting practice to 5.5 lb in the shell molding process.

Other processing advantages that accrue from this combination of molding techniques and ductile iron include: the minimizing of the balance operation; elimination of mass centering machines; reduced machine downtime due to inadequate clearance; and elimination of sand in casting surface. These advantages are present with no sacrifice of engineering properties.

Rocker arms constitute the next largest tonnage for automotive applications of ductile iron in the U. S. It has been substituted for pearlitic malleable at a reduced cost with no heat treating required.

The differential carrier has also been switched to ductile iron from ferritic malleable by one of the automotive producers and is undergoing trial by another. Utilization of ductile iron in this application has resulted in a weight reduction through redesign of all sections. It has also demonstrated an improved machinability over previous materials.

The automotive industry in Europe has put ductile iron to more extensive use in all applications. It has been tested and finally adopted for an ever-increasing variety of parts. Some of the applications that might be considered in this country are: bearing caps, camshafts, various gears, gear boxes, clutch housings, rear axle housings, planet gear holders, and differential body. Substitutions were made either from gray cast iron or malleable iron and were prompted by weight considerations and, in some cases, strength demands.

All of the parts already discussed are being used in Diesel engines, marine engines, and small gasoline engines. In the instance of Diesel engines, such components as heads and cylinder blocks have done well.

Chassis Uses

Moving from the power plant to the chassis, we find very little ductile iron in use. This is true because of the structural characteristics of this part of the automobile. In this country, about the only use in the passenger car field is the rear spring supports. In the trucking industry there is some ductile iron used as body bolsters and equalizer beams which have replaced forgings.

In Europe, once again, the material has been put to greater use. For many years now, ductile iron has been used with satisfactory results in the Swedish SAAB car as a brake drum material. Integrally cast hubs and drums are gaining ever-widening recognition. Such drums have already been subjected to inertia dynamometer and road tests. Both pearlitic and ferritic (annealed) castings were compared to conventional material.

Test results show that pearlitic ductile wore slightly less than standard material, while ferritic performed better than either of the other two materials. In addition, temperature of "fade" was higher and brake "squeal" was virtually eliminated when ferritic ductile was used. Ductile iron is also being used as a brake material in

(*Turn to page 74, please*)

Automotive Applications of DUCTILE IRON

Present

Bearing boxes
Body bolsters (truck)
Brake, drums, cylinders, shoe segments
Clutch carrier, allied parts
Crankshafts
Differential parts
Fly wheels
Gear carriers, selectors, boxes
Hinge parts, handles, brackets
Hydraulic cylinders, rams
Jack bodies, hoist parts
Pedals
Rear spring supports
Reverse gear transmission, marine
Rocker arms
Rotor, supercharger
Starter housings
Tire iron
Torque converter parts (truck)
Torque rods
Torque tube mounting bracket
Trailer hitches
Valve housings

Potential

Bearing caps
Bearing support ring (gas turbine)
Camshafts
Connecting rods
Cylinder heads, liners
Deck hangers, hinges
Door hangers, hinges
Exhaust manifolds
Water pump housings
Heat riser valve parts
Pistons
Power steering parts
Rear axle housing

Reliability Emphasized at Aircraft Hydraulic Conference

By Joseph Geschelin
DETROIT EDITOR

NINTH renewal of the Aircraft Hydraulics Conference, sponsored by Vickers, Inc., drew a record attendance of 150 guests from among foreign and domestic airlines, the military services, airframe manufacturers, producers of components and other suppliers. It was a tribute to this unique enterprise for the advancement of the art and in the interest of reliability in a field where reliability means more than money.

This year's Conference not only was big in numbers but had a double-barreled impact. While the basic theme was beamed at airline jet fleet operation, one session was devoted exclusively to the concepts of space vehicles—their design and components.

Current experience with the hydraulic system in the 707 jet airliners was described by Paul Hartline of TWA. Analyzing flight delays due to scheduled as well as unscheduled unit removals, Hartline emphasized that fluid leaks were the major problem. Leaks have been due to dynamic seal failures and, in some instances, due to high pressure hose failures. There are also some problems incident to the use of Skydrol 500 A fluid.

Similarly, Cale H. Merrill of Vickers reported on experiences with hydraulic motor-pumps installed on the Lockheed Electra.

In both instances there was personal communication between suppliers and users with a free exchange of criticism and the airing of procedures and practical fixes. The important point is that all operators of the same types of aircraft had an opportunity to exchange experiences and fixes to the benefit of the entire group.

The properties and usage of Skydrol 500 A—a non-toxic formulation—were described by Dr. Roger Hatton of Monsanto. He discussed the effects of thermal stress, mechanical shear, moisture, and contamination. Important to note is the fact that even new fluid in its original package must be well filtered before using to remove contamination stemming from storage and packaging. Too, Skydrol has a specific shelf life, varying with conditions which must be taken into account by the user.

The role of small gas turbines in providing the source of self-sufficient hydraulic APU systems for helicopters was discussed at length by Sumner Alpert of Solar Aircraft. He showed that self-contained main engine starting and auxiliary power units are economically justified as the number of operating bases is increased. Gas turbine driven hydraulic systems are characterized by low weight, reliable starting, low maintenance, and long life. Moreover, they relieve the main propulsion engine of cumbersome and inefficient ground operation.

Is the fluid power art equal to the task of meeting the requirements of high performance aircraft, super-performance rockets, and spacecraft? According to B. Mayhew of Republic Aviation, the answer is—Yes, but not yet. In his paper on high temperature hydraulics systems he analyzed the problems incident to operations in an environment of 400 F, 700 F, and future requirements of 1000 to 1500 F. Mayhew then discussed the requirements imposed on the fluid, seals, servo valves, pumps, and actuators. He concluded that much work has to be done before these problems can be resolved.

One of these days we shall have supersonic transports of Mach 3 capabilities, cruising at 60,000 to 80,000 feet with take-off gross weight between 150,000 and 175,000 lb, requiring takeoff thrust around 100,000-lb. A typical mission might be 2000 miles with approximately 10 minutes take off and climb to 70,000-ft altitude, about 50 minutes cruise at Mach 3, and 15 minutes for let-down and landing. According to John Woodward of Vickers such aircraft will require economical auxiliary power systems and he described hydraulic packages capable of serving flight controls, utility systems, and intermittent duty items. His analysis also showed that the hydraulic package was the most advantageous when compared with other types. Vickers thinking at the present time is in terms of systems employing 5000 psi with temperature of 400 F. One of the airframe engineers commented that future aircraft made non-propulsion systems a must since they can't fly without them.

An allied problem is the need for cooling the electronic gear of high performance aircraft and space vehicles. J. Sember of Vickers reported that his company is producing large airborne cooling system employing fluorochemical liquid and capable of dissipating an input of 47-kw with a unit weight of only 2-lb/kw. This development also facilitates the development of ground support and factory test equipment. Stemming from current work Vickers is convinced that best results can be achieved if the power generation and cooling scheme are considered as a complete system rather than as individual sub-systems. This is particularly true of applications for supersonic aircraft.

Looking into the future, Robert W. Curran, Boeing Airplane Co., discussed the requirements of non-propulsive power for space vehicles and compared the competitive features of many systems now under consideration. In this connection he observed that for the near future average non-propulsive energy demands, aside from re-entry, will be less than 5-kw. An inter-

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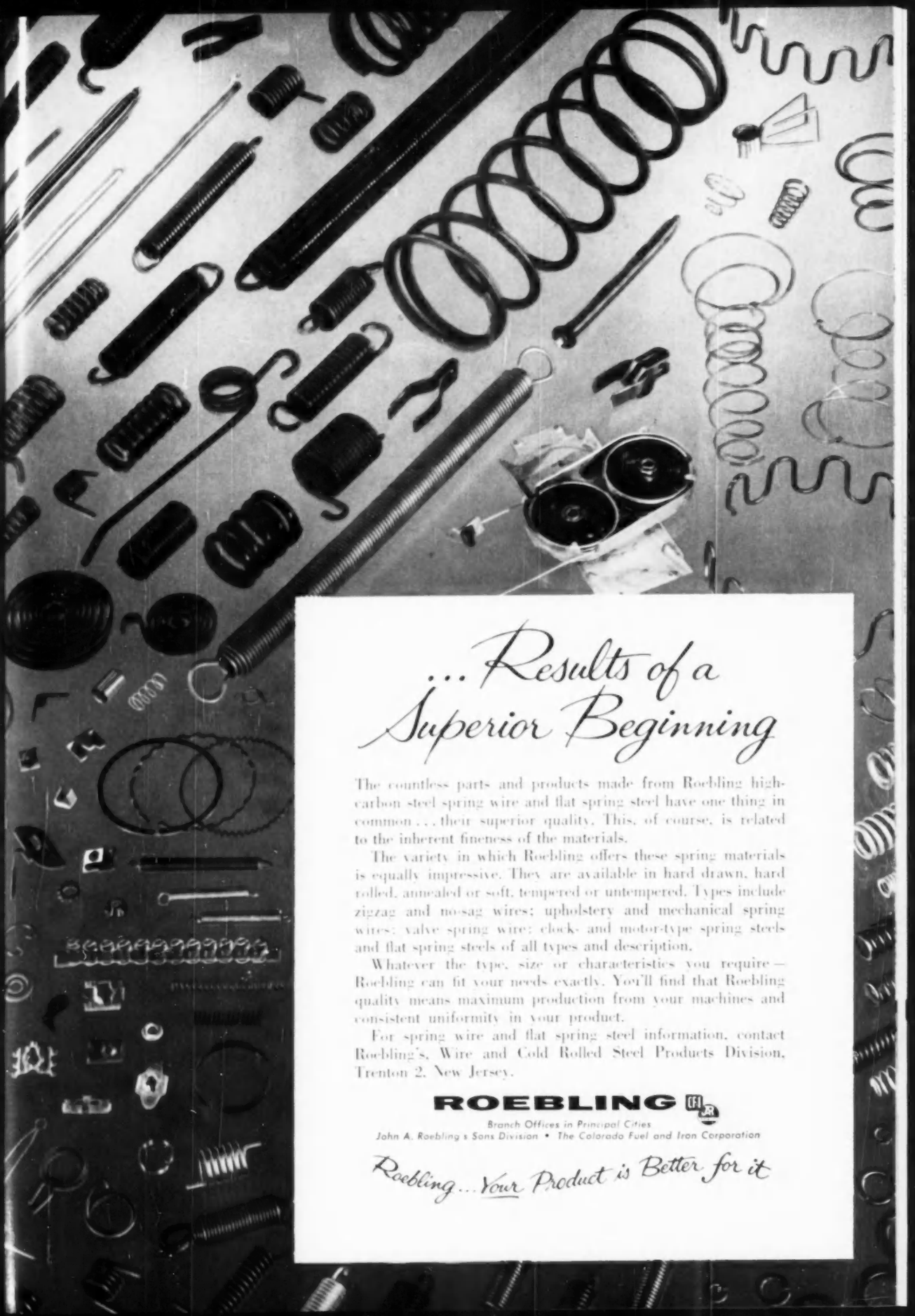

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For spring wire and flat spring steel information, contact Roebling's, Wire and Cold Rolled Steel Products Division, Trenton 2, New Jersey.

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To transfer power and provide dual P.T.O.'s to meet the specialized requirements of traction and pump drives on large crash trucks, Ward LaFrance Corporation, Elmira Heights, New York, relies on Cotta Model TR-953 Heavy-Duty Transmission.

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Whatever is at stake — human lives, crucial work schedules, or profits — there is no more dependable power take-off for big pumps than Heavy-Duty Cotta Transmissions.

For long, continuous duty around the clock, regular intermittent duty, or sure response to emergency calls for power, lasting protection is built into every gear. Hard and wear-resistant on the faces... tough and shock-resistant in the cores . . . Cotta gears stand up for the lifetime of the equipment, operate smoothly, eliminate costly repairs, and reduce maintenance. Heavy-duty Cotta units are in service by the thousands on rail cars, winches, drilling rigs, trucks, hoists, and dozens of other types of heavy-duty equipment.

If you have a heavy-duty power transmission problem with input torque ranging from 150 to 2000 ft-lb, Cotta standard or engineered-to-order transmissions provide the dependable service you need without standing performance at low cost.

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Sent free on request — diagrams, capacity tables, dimensions, and complete specifications. State your problem — COTTA engineers will help you select the right unit for best performance. Write today.

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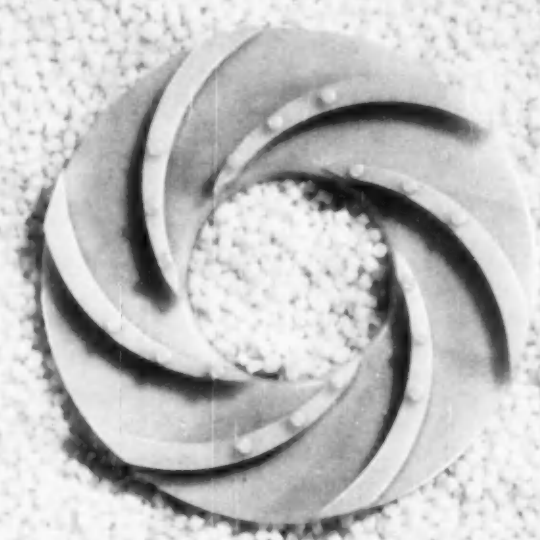
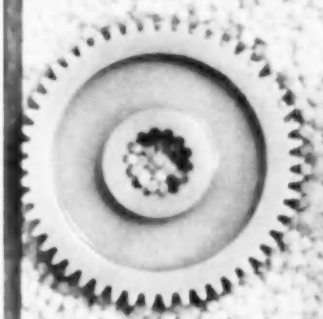


Du Pont announces



Delrin®

ACETAL RESIN

...a completely new engineering material offering a combination of properties unmatched by any other thermoplastic

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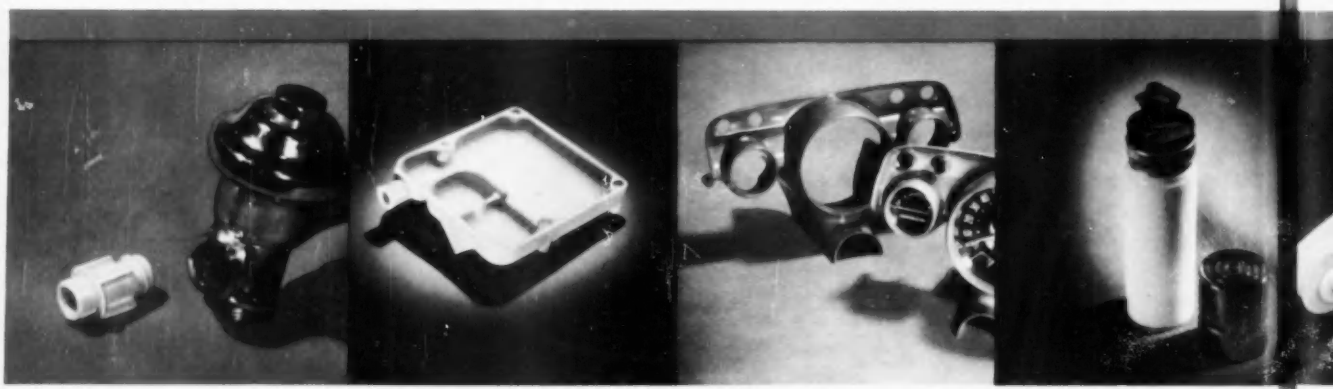
This is Du Pont Delrin®:

"Delrin" acetal resin is a highly crystalline, stab
form of polymerized formaldehyde. This com
pletely new material offers you metal-like me
chanical properties, such as a high degree
strength and rigidity, plus other properties tha
metals do not possess.

The combination of properties offered b
"Delrin" is unequaled by any other thermopla
tic. For example, "Delrin" has high dimension
stability, tensile and flexural strength, resilienc
and toughness. Most importantly, "Delrin" re
tains these desirable properties under a wide rang
of service conditions—temperature, humidity
solvents and stress.

Over the past three years, "Delrin" has bee

Typical performance and production advantages of "Delrin"



A brass part in a commercial flush valve was duplicated in "Delrin". This part operated perfectly for 18 months—the period of test—although it was completely and continuously immersed in water. The outstanding dimensional stability of "Delrin" under a wide variety of service conditions has also been proved, for example, in showerheads (continuously running water at 150°F.), and movie projector gears (run over 2,000 hours at ambient humidity).

This textile solution pan is ordinarily made of stainless steel. It must have resistance to oils and organic solvents, a clean, smooth surface; it also requires several threaded inserts plus other details. In normal quantities, stainless steel pans cost approximately $25 each. Injection molded in "Delrin", the cost was quoted at about $3 each. Testing showed that "Delrin" provided the required finish without machining, the needed solvent resistance, plus a weight saving of 75%.

A zinc die-casting mold was used to make this instrument cluster of "Delrin". Weight was reduced over the zinc component by almost 80%. In addition to manufacturing economies, further savings in assembly are indicated: self-tapping screws can be used, since the creep resistance of "Delrin" prevents loosening or stripping. These clusters can be molded in integral color or painted, and with a conventional mold would require little, if any, mechanical finishing.

Aerosol containers made
"Delrin" were shelf-stored for ov
a year; others stored for 3 mont
at 130°F. In both cases, the co
tents were still completely de
chargeable. "Delrin" retains
strength and toughness for lo
periods, even when exposed to el
vated temperatures and organic s
vents. Equally important are th
new opportunities for high styl
opened by "Delrin"—the freedo
to design in new shapes and in te
gral colors to suit purchasing trer

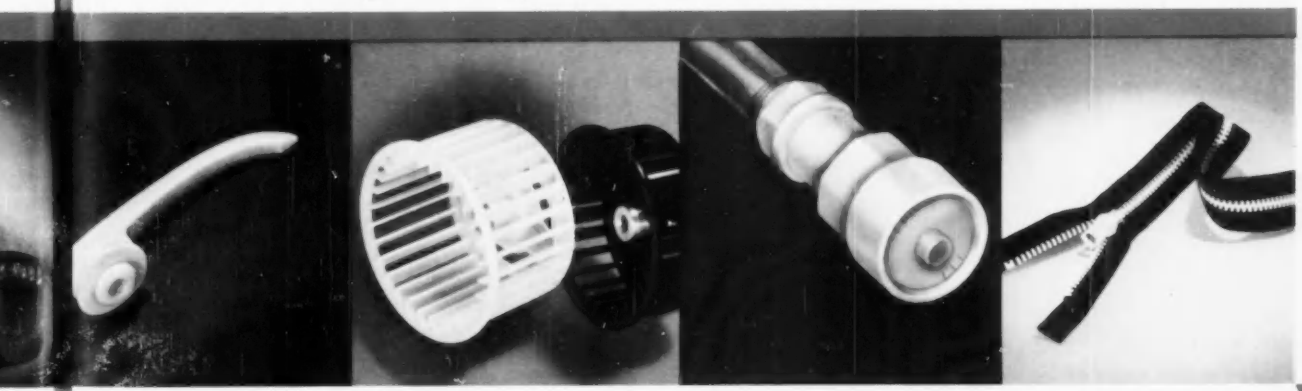
BINDING

tested in hundreds of end-use applications by a host of industrial concerns. These tests have confirmed that parts made of "Delrin" can compete *on a performance and cost basis* with parts made of many metals, rubber, glass or wood. Of the various end-uses tested, 75% would normally be made of metal and another 10% of rubber, glass or wood. These tests have resulted in many applications of "Delrin" now being readied for commercial production—including gears, bearings, housings, containers, plumbing and hardware parts, pump impellers, "squirrel-cage" blowers, door handles, clothing fitments and many others.

In addition to metal-like performance, "Delrin" offers you the manufacturing economies inherent in the production methods of the plastics industry. "Delrin" is easily injection molded, extruded, blow-molded or fabricated with conventional machine tools.

Illustrated below are a few of the applications of "Delrin" which have undergone extensive field service tests. The performance and economies listed were indicated during comparative evaluations made with materials in use at the time of the tests. These applications, together with additional data on the following page, may well suggest ways in which this versatile new engineering material can help *you* improve a product, lower its cost or develop new designs for your profit. Your inquiry is invited (see coupon on next page).

rin" evaluated during three years of field tests . . .



Accessories usually made of metal, such as automotive window cranks and refrigerator door handles, can be economically mass-produced in "Delrin" by injection molding. "Delrin" provides required strength and rigidity. In-eral colors, a variety of surface effects and functional details can be produced in one operation. ss weight, improved styling, de-ndable performance and poten- cost savings are made possible "Delrin".

Industrial components such as this "squirrel-cage" blower—as well as a variety of gears, bearings and other mechanical parts—have demonstrated the ability of "Delrin" to compete with various metals on a performance and cost basis. "Delrin" offers excellent fatigue life even when immersed in oil or water. Rapid production of lightweight, intricate components by the injection molding process can lead to substantial manufacturing economies with "Delrin".

Plumbing fixtures made of "Delrin", such as this showerhead, offer the manufacturer new styling and design advantages . . . and the home owner new latitudes in bathroom décor. Injection molded in integral color, fixtures made of "Delrin" assure builders and home owners of long-term dimensional stability, freedom from rust and mineral build-up. Modern in design, they are durable and dependable in service, and provide opportunities for potential cost savings.

Clothing fitments, such as zippers, clasps and snaps, are also readily and economically molded in "Delrin". Stiffness, toughness and resistance to heat, body oils and perspiration make "Delrin" a logical choice for such uses. Your customers would welcome the light weight, colorability and warm-to-the-touch benefits "Delrin" offers. Extensive field tests have demonstrated that "Delrin" is one of the most promising new materials available to the fitments industry.

TYPICAL PROPERTIES OF "DELRIN" ACETAL RESIN

PROPERTY		ASTM NO.	AVERAGE VALUES FOR "DELRIN"* 500X	150X
Elongation	—68°F.	D638	13%	38%
	73°F.	D638	15%	75%
	158°F.	D638	330%	460%
Impact strength, Izod	—40°F.	D256	1.2 ft.lb. in.	1.8 ft.lb. in.
	73°F.	D256	1.4 ft.lb. in.	2.3 ft.lb. in.
Tensile strength and yield point,	—68°F.	D638	14,700 psi	
	73°F.	D638	10,000 psi	
	158°F.	D638	7,500 psi	
Compressive stress at 1% deformation		D695	5,200 psi	
at 10% deformation			18,000 psi	
Flexural modulus,	73°F.	D790	410,000 psi	
	170°F.	D790	190,000 psi	
	250°F.	D790	90,000 psi	
100% RH 73°F.		D790	360,000 psi	
Flexural strength		D790	14,100 psi	
Sheer strength		D732	9,510 psi	
Heat distortion temperature,	264 psi	D648	212°F.	
	66 psi	D648	338°F.	
Fatigue endurance limit, 50 to 100% RH 70°F.			5,000 psi	
100% RH 150°F.			3,000 psi	
Water absorption, 24 hours immersion		D570	0.12%	
equilibrium, 50% RH		D570	0.2%	
equilibrium, immersion, 77°F.			0.9%	
Specific gravity		D792	1.425	
Rockwell hardness		D785	M94, R120	
Flammability		D635	1.1 in. min.	
Melting point (crystalline)			347°F.	
Flow temperature		D569	363°F.	

PROPERTY	ASTM NO.	AVERAGE VALUES FOR "DELRIN"*
Deformation under load (2,000 psi at 122°F.)	D621	0.5%
Coefficient of linear thermal expansion	D696	4.5 x 10⁻⁵ per °F.
Taber abrasion (1000 gm. load, CS-17 wheel)	D1044	20 mg./1000 cycles
Thermal conductivity		1.6 BTU/hr./sq. ft./°F./in.
Specific heat		0.35 BTU/lb./°F.
Modulus of rigidity		178,000 psi
Poisson's ratio		0.35
Dielectric constant, 73°F., 10^3-10^5 cps	D150	3.7
Dissipation factor, 73°F., 10^3-10^5 cps	D150	.004
Dielectric strength, short time	D149	500 V./mil
Volume resistivity	D257	6 x 10^{13} ohm-cm
Resistivity	D257	2 x 10^{13} ohm
Arc resistance	D495	129 seconds (burns)

		P Factor at 73°F.
Permeability	Water	1.9
	Ethanol	0.2
	Freon® 12-114 (20-80)	< 0.2
	Methyl Salicylate	0.3

gms. loss/24 hrs./100 in² area/mil thickness. Determined on bottles with 35-50 mil wall thickness.

Resistance to Organics:		Room Temp.	120°F.
	CCl₄	1.2	5.7
	Toluene	2.6	2.8
	Acetone	4.9	2.6
	Alcohol	2.2	1.9
	Ethyl Acetate	2.7	2.9

% wgt. gain—12 mo. total immersion. Vol. change proportional to wgt. change.

*These values are representative of those obtained under standard ASTM conditions and should not be used to design parts which function under different conditions. Since they are average values, they should not be used as minimums for material specifications.

DELRIN® ACETAL RESIN *offers design engineers a new combination of properties*

"Delrin" acetal resin offers you a combination of properties and potential cost advantages never before offered by any single material. Specific values of typical properties of "Delrin" are listed in the table above . . . and the advantages implicit in these figures have been thoroughly tested in a wide variety of end-uses.

Today is your best opportunity to consider how Du Pont "Delrin" can help you improve the design of a product or develop your designs on new products. Within the next few weeks a new plant to manufacture "Delrin" in commercial quantities will come on stream at Parkersburg, W. Va. This plant is your assurance that your design improvements can fast become practical realities. Commercial molders, already familiar with "Delrin", can provide you with valuable assistance in your problem.

A specialized group of Du Pont engineers, as well, can help you with their experience and knowledge gained during years of market development work with "Delrin". They may well have tested the very product or component you are considering.

FOR MORE SPECIFIC INFORMATION MAIL THIS COUPON

E. I. du Pont de Nemours & Co. (Inc.), Advertising Department
Nemours Building, Rm. 99D, Wilmington 98, Delaware

I am interested in evaluating "Delrin" for the following use:_____

NAME

COMPANY POSITION

STREET

CITY STATE

In Canada: Du Pont of Canada Limited, P.O. Box 660, Montreal, Quebec.

DELRIN®
ACETAL RESIN

DU PONT
REG. U.S. PAT. OFF.

BETTER THINGS FOR BETTER LIVING
THROUGH CHEMISTRY

METALS

With Mills Operating at Above 95 Per Cent of Capacity, Demand for Almost Every Type of Steel Outruns Supply.

By William F. Boericke

Record Steel Output Seen for 1960

According to an estimate by the chairman of Inland Steel, steel ingot production in 1960 could hit a record of 130 million tons provided the strike is not resumed. This would be 13 million tons higher than the previous record set in 1955 and 38 million tons more than estimated 1959. The predicted 1960 production would result in 93 million tons of finished steel.

Finished steel shipments are expected to reach a peak in December or January. It doesn't appear that the mills can build up significant stocks of semi-finished steel, nor that customers will be able to rebuild their depleted inventories, although most mills are operating above 95 per cent capacity to try to obtain all possible tonnage before a January walkout, if it comes. Demand for almost every type of steel mill product outruns supply. Sheet mill products, notably galvanized, cold rolled, and tin plate, are in the strongest demand. Some look for capacity operations in galvanized sheets and tin plate throughout 1960. Controlled distribution seems inevitable for months to come.

Iron Age says automobile makers expect to take about 30 per cent of finished steel in the first half of 1960. Railroad car shops and builders are pushing for more steel—they are far behind in their programs. Indications are good for a flood of new orders for freight cars. As the outlook for rail traffic improves shortages are showing up the poor condition of rolling stock.

Iron Ore Shipments Continue Late

In an all-out effort to bring in every possible ton of iron ore before navigation is closed for the winter the steel mills have stepped up imports and rail shipments besides operating the lake ore boats later than ever before. These measures may prevent any complete drying-up of Lake Superior ore stocks. But the supplies will be unevenly distributed and it will probably boost the demand for steel scrap.

No Increase in Ore Prices

It has been announced that Cleveland Cliffs intends to hold its price for iron ore unchanged in 1960 if there is no increase in the price of steel. The company in recent years has taken the lead in announcing a Lake Superior ore price for the season. Referring to imports it was estimated that 1960 may call for 40 million tons of iron ore from abroad.

Aluminum Producers Curtail Output

The aluminum industry will end the year with a production of primary metal exceeding 1,900,000 tons comfortably exceeding last year's total of 1,560,000 tons. But the monthly production rate is falling and December may make an unfavorable comparison with earlier months. Plant inventories remain high and it seems evident that consumption is not keeping pace with production capacity. Reduced operating rates have been put into effect by the producers that indicate that present output is only about 84 per cent of installed capacity or about 76 per cent of planned capacity.

Price Increase Wanted

By mid-December it seemed evident that settlement would be made shortly with the unions for a new contract. Work has not been interrupted as any wage increase granted will be made retroactive. If a higher wage is granted it would put a real squeeze on profits for the producers unless a price increase for the metal is obtained. They undoubtedly would have much justification for getting it as their metal still sells for less than in April, 1958. But whether a price rise can be maintained seems rather doubtful. Aluminum sells abroad about 22½ cents a pound or more than 2 cents under the domestic price. Aluminium Ltd. has shown no special inclination thus far to go along on an advance in the primary metal price. And unless the big Canadian company joins with the domestic producers in a price hike it seems unlikely to go very far. Thus a price rise in U. S. appears to hinge on a higher market in Europe.

Convincing proof of the anxiety of Aluminium Ltd. to expand sales at the risk of some popular disapproval is its recent decision to sell 5000 tons of aluminum to Communist China, and more if possible. This appears directly to reverse its previous policy of not to sell to that country because of U. S. disapproval.

Spot Copper in Very Short Supply

Copper is in the odd position of being definitely in very tight supply for immediate demand yet with every assurance that ample supplies, probably oversupplies, will become available when work is resumed at all the mines and smelters. The price situation indicates this clearly. Spot copper, if available at all, commanded 33 cents a pound in mid-December. Dealers in small lots ask 38-39 cents. But copper for future delivery on the Commodity Exchange is offered at 29½ cents for May delivery in contrast with 34½ cents for the December option. The same thing is true in London where spot copper sells about 2½ cents higher than metal to be delivered 90 days hence. (*Turn to page* 64, *please*)

Skoda Automobile Plant Boosts Production with Western Machines

By David Scott
Special European Correspondent
for AUTOMOTIVE INDUSTRIES

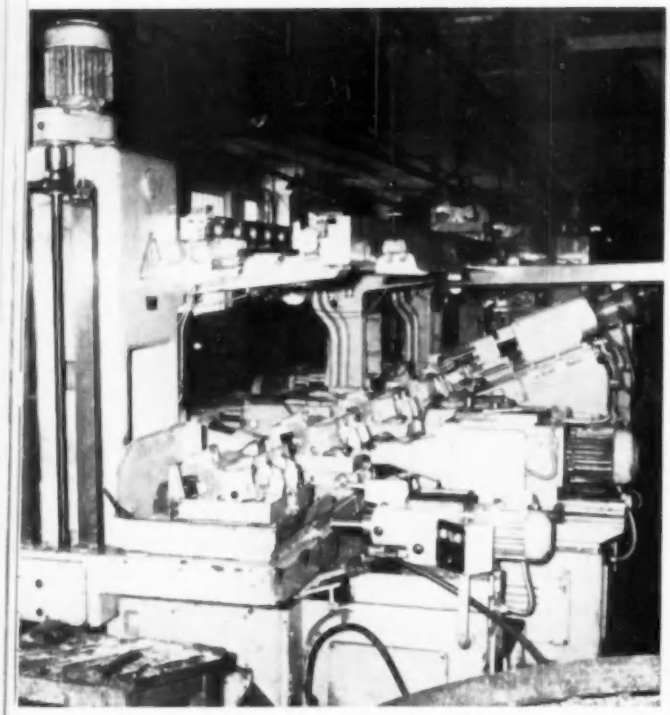
CZECHOSLOVAKIA is grooming itself to become not only by far the largest car manufacturing country in the Communist bloc, but also one of the major producers and exporters in Europe. It has recently embarked on a vast expansion program aimed at raising annual production of passenger cars from the present level of 50,000 units to 400,000 in the next decade.

New capital investment is being poured into the Skoda factory at Mlada Boleslav, and the current daily output of 190 units is planned to increase to some 500 by 1970. While this is as yet Czechoslovakia's only mass-producing automobile plant, according to press reports there are plans to build an entirely new factory to make a different model on an even greater scale.

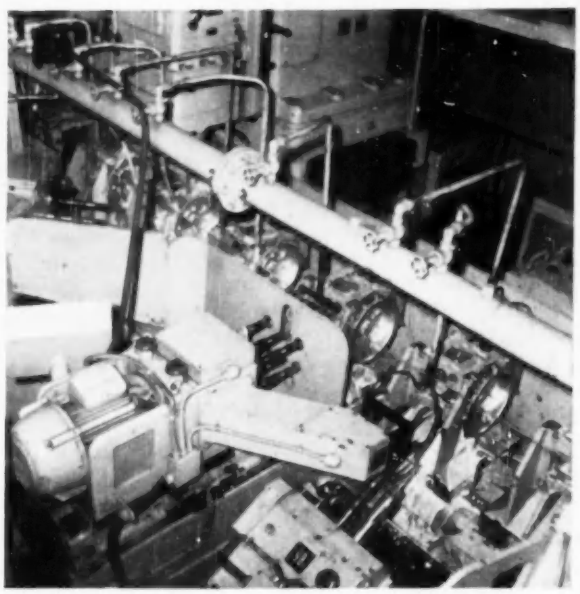
This plant, also to be at Mlada Boleslav, is expected to cost the equivalent of over $400 million, and

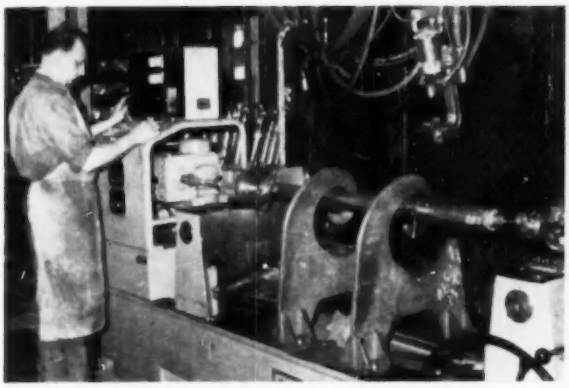
First leg of the Czech-built cylinder block transfer line drills, reams, taps and deep - drills the aluminum casting in six work stations.

Second section of the cylinder block line has eight work stations, and the platen-mounted fixtures use hydraulic clamping operated by an external drive at the load-unload station in the foreground.



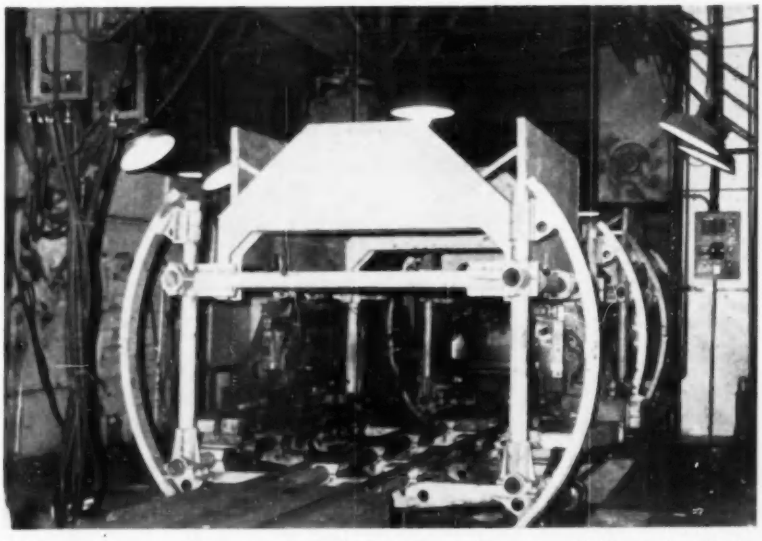
Hüller 28-station transfer line for aluminum gearbox housings features inspection probes tandemed with and corresponding to the three tapping heads shown in this sectional view. (Transfer is from right to left.) In each case the drilled holes in the next casting, being machined at the previous work station, are checked by an extension arm that feeds in with the unit head.





Propeller shafts are checked and corrected on this Schenck dynamic balancer. Size and axial position of the necessary weights are calculated on circular charts while the machine is run at 2500 rpm, after which the divided weight is spot-welded to each end of the shaft in equal parts. Spiral safety guard was added by Skoda.

Plating installation was made by Blasberg in West Germany under American (Udylite) license. It comprises baths for degreasing, copper, nickel and chrome, with elevating transfer equipment.



Roll-over jigs near the end of the final body welding line. Built at the Skoda plant, they rotate through 180 deg on circular tracks to give easy access to the body sides and floor. Elsewhere, many of the multi-spot welding presses are of Belgian origin.

is designed for an output of 1000 cars daily, ultimately rising to 2000. Construction is to start in 1960, and will take six years to complete. The new car is believed to be a 900-cc rear-engined vehicle similar in design to the Renault Dauphine.

The Skoda car factory is now halfway through its own six-year program. During a visit to Mlada Boleslav in September it was learned that the initial target, set for 1963, was to double the daily production to 300 without substantially increasing the payroll of some 10,000. Total investments will equal $150 million, earmarked for completely new buildings and shops for the press, forging, plating, paint and other sections, as well as for modern machinery and conveyors.

The program is in full swing, and perhaps its most significant aspect is the amount of equipment bought from the West. This accounts for a sizeable part of total expenditure to date, and follows the easing of western restrictions on strategic exports that began in 1956. It also stems from the shortage of many types of special-purpose machines within the Communist bloc, coupled with a preference for such western equipment by Czech production engineers who have a high regard for its reliability and accuracy on repetitive work.

One of the largest single installations at Skoda is an automatic chrome plating plant made by Blasberg in Germany under American (Udylite) license. Another is a 28-station Hüller transfer line for machining the transmission housing. It was installed 20 months ago at a cost of over $250,000.

Among other West German machines in use are a pair of Fortuna crankshaft grinders with automatic sizing, a Kieserling & Albrecht peeler for surfacing bar stock, several Klingelnberg double-headed gear cutters for producing differential pinions, and a Schenck dynamic balancer for propeller shafts. A number of Schüler presses have just been started up in the new press shop, including a coil-fed transfer unit for hub caps, and a wide-bed 800-ton machine fitted with double dies.

From elsewhere in western Europe there are 15 Swiss George Fischer copying lathes, a pair of GFM Steyr crank millers, Olivetti automatic camshaft grinders, and four multi-spot welding presses made by Electromecanique, Brussels, for the body floor sections.

Working alongside such equipment are many Communist-built imports that have also started operation in recent months. To single

(*Turn to page* 66, *please*)

• • INDUSTRY STATISTICS • •

WEEKLY U. S. MOTOR VEHICLE PRODUCTION

As reported by the Automobile Manufacturers Association

Make	Weeks Ending Dec. 19	Weeks Ending Dec. 12	Year to Date 1959	Year to Date 1958
PASSENGER CAR PRODUCTION				
Total—American Motors	9,567	10,452	389,374	207,896
Chrysler	1,250		65,626	47,550
De Soto	520		40,179	35,156
Dodge	6,165		180,199	110,151
Imperial	742	396	19,930	13,090
Plymouth*	9,698	1,943	394,144	355,535
Total—Chrysler Corp.	18,375	2,339	700,078	561,482
Edsel			29,677	24,417
Ford*	37,257	34,921	1,481,249	1,000,424
Lincoln	941	933	29,289	24,883
Mercury	3,699	3,955	150,363	122,310
Total—Ford Motor Co.	41,897	39,809	1,690,578	1,172,034
Buick	8,467	4,013	221,681	246,131
Cadillac	3,657	2,978	133,286	120,827
Chevrolet	45,697	14,203	1,368,960	1,202,594
Oldsmobile	11,176	4,645	353,013	298,428
Pontiac	10,341	4,832	375,446	209,146
Total—General Motors Corp.	79,338	30,671	2,452,386	2,077,126
Total—Studebaker-Packard Corp.	3,247	3,295	149,176	53,057
Checker Cab	359	298	5,357	3,194
Total—Passenger Cars	152,783	86,864	5,386,949	4,074,789
TRUCK AND BUS PRODUCTION				
Chevrolet	7,411	1,616	314,271	267,886
G. M. C.	1,352	1	72,828	59,609
Diamond T	71	55	5,239	5,728
Divco	80	80	3,684	2,884
Dodge and Fargo	1,778	823	69,007	57,141
Ford	6,442	6,361	323,317	235,381
F. W. D.	25	22	1,039	1,193
International	2,480	2,431	139,757	80,957
Mack	280	280	16,593	13,824
Studebaker			11,056	10,118
White	432	432	19,339	18,956
Willys	1,310	336	108,290	90,389
Other Trucks	60	55	3,506	3,042
Total—Trucks	21,721	12,492	1,087,930	845,110
Buses	100	75	2,453	2,964
Total—Motor Vehicles	174,604	99,431	6,447,332	4,922,863

* Plymouth includes Valiant; Ford includes Falcon; and Chevrolet includes Corvair.

NEW FOREIGN CAR REGISTRATIONS

OCTOBER

1959		1958	
Volkswagen	11,589	Volkswagen	6,823
Renault	8,700	Renault	5,710
Opel	3,250	English Ford	3,676
Fiat	2,955	Fiat	2,266
English Ford	2,929	Vauxhall	2,025
Simca	2,422	Hillman	1,878
Vauxhall	1,852	Opel	1,691
Triumph	1,946	Simca	1,560
Hillman	1,833	Triumph	1,490
Volvo	1,444	Volvo	1,416
All Others	12,903	All Others	10,391
Total	51,923	Total	38,925

FIRST TEN MONTHS

1959		1958	
Volkswagen	94,344	Volkswagen	65,245
Renault	73,944	Renault	37,419
English Ford	38,107	English Ford	26,789
Opel	33,097	Fiat	18,603
Fiat	32,409	Hillman	14,646
Simca	31,110	Vauxhall	14,010
Hillman	24,163	M. G.	13,931
Triumph	19,995	Simca	13,859
Vauxhall	19,216	Triumph	13,628
Volvo	15,659	Opel	12,169
All Others	127,381	All Others	76,565
Total	507,425	Total	304,844

TRACTOR SHIPMENTS

WHEEL TYPE

Hp Ratings	October	Nine Months
9-29 belt hp	2,568	20,128
30-34 belt hp	3,347	31,570
35-39 belt hp	3,733	36,829
40-49 belt hp	4,887	37,471
50-54 belt hp	4,241	39,502
55-59 belt hp	2,117	24,802
60 belt hp and over	2,448	34,890
Total	23,421[1]	225,192[2]

TRACKLAYING TYPE

Under 50 drawbar hp	1,761	13,577
50-74 drawbar hp	372	4,234
75 drawbar hp and over	894	12,834
Total	3,027[3]	30,645[4]

1 Valued at $50,845,000.
2 Valued at $498,545,000.
3 Valued at $23,758,000.
4 Valued at $293,119,000.

1959 NEW REGISTRATIONS

Arranged in Descending Order According to the Ten Months, 1959 Totals

NEW CARS

Make	October 1959	September 1959	October 1958	Ten Months 1959	Ten Months 1958
Chevrolet	127,880	112,909	69,954	1,273,762	1,039,845
Ford	120,311	106,151	72,472	1,225,085	810,297
Pontiac	39,172	29,174	13,705	340,331	184,149
Plymouth	32,327	30,765	30,748	330,117	331,761
Oldsmobile	37,509	27,059	17,794	320,615	249,540
Rambler	28,089	27,789	19,066	302,377	142,568
Buick	24,388	14,733	19,264	212,103	209,591
Mercury	14,398	12,447	9,529	130,016	115,312
Dodge	17,079	11,073	12,809	127,302	113,404
Cadillac	13,525	9,201	6,120	120,814	102,198
Studebaker	11,017	8,010	2,596	110,294	32,956
Chrysler	5,286	4,907	3,823	53,312	50,480
De Soto	3,252	3,323	3,542	37,644	40,916
Edsel	2,999	3,122	1,889	36,808	30,737
Lincoln	2,146	1,692	1,553	22,614	22,117
Imperial	2,190	1,002	843	14,842	12,269
Misc. Domestic	191	141	310	3,567	5,008
Foreign	51,923	53,787	38,925	507,425	304,844
Total—All Makes	533,682	457,285	324,942	5,169,028	3,797,992

NEW TRUCKS

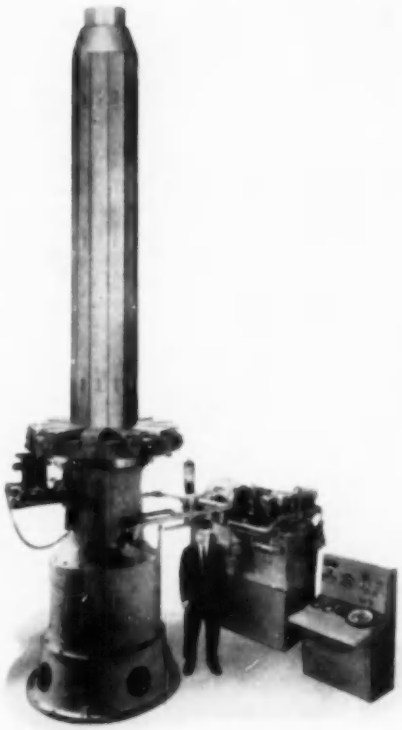
Make	October 1959	September 1959	October 1958	Ten Months 1959	Ten Months 1958
Chevrolet	23,737	21,960	16,564	274,010	205,700
Ford	25,403	27,671	15,916	243,964	169,256
International	9,911	9,325	8,534	88,857	74,684
G. M. C.	5,356	6,274	4,849	60,460	45,789
Dodge	4,287	3,573	2,255	45,074	30,117
Willys Truck	2,046	1,756	1,654	15,514	11,173
White	1,278	1,419	1,114	12,938	9,920
Mack	1,013	1,159	1,207	11,477	10,039
Willys Jeep	1,196	976	900	8,070	5,742
Studebaker	520	516	222	5,370	3,499
Diamond T	345	262	295	2,482	2,458
Brockway	118	121	106	977	752
All Others	3,597	3,772	3,432	34,825	26,992
Total—All Makes	78,807	78,784	57,038	804,018	596,121

Source: Based on data from R. L. Polk & Co. All rights reserved. Re-use prohibited.

NEW PRODUCTION and PLANT EQUIPMENT

FOR ADDITIONAL INFORMATION, please use reply card at back of issue

1580 Ton Hydraulic Expander Has 16 Foot Jaw Height



Major advances in missile production at the Douglas Aircraft Company are expected to result from the development of a new expander, model 40-H-1580, by the Grotnes Machine Works. This is so because parts that heretofor could neither be positively sized nor straightened due to their excessive length and small diameter, coupled with heavy wall thicknesses and high material yield strengths, can now be expanded to produce accurate diameters and concentricities within the most critical requirements. It can accommodate an infinite variety of die shapes and sizes, and can handle parts having internal diameters from 36 to 74 in., in lengths up to 16 ft.

Circle 40 on postcard for more data

Foam Testing Unit

A FOAM testing device is said to give accurate compression modulus readings when used on the new urethane foams. This instrument uses the industry-standard 50 sq in. compression ft and utilizes specially designed disc weights. A feature of this tester is that no calculations are required, on standard tests, since height and deflection are automatically indicated by scales. The standard model has a compression range of 42.5 lbs, which may be increased to 62.5 lbs by the addition of weights. Known as the Wohler Foam Tester, this unit is produced by the *Browning Instrument Co.*

Circle 41 on postcard for more data

Vertical Chucking Grinder

GRINDING needs are satisfied, in some instances, by the utilization of an attachment that replaces the metal turning tool without removing the work piece from the machine. The operator will machine the workpiece to a specified plus tolerance and then employ this grinding device to attain the desired dimention and finish. *The Standard Electrical Tool Co. Precision Spindle Div.*

Circle 42 on postcard for more data

Gear Tooth Deburrer

A TWIN SPINDLE automatic high speed grinder has been designed to simultaneously deburr and chamfer the entire contour of both ends of the teeth on spur, helical or bevel gears. The grinder drives reinforced wheels at 17,000 rpm with standard air spindles. Spindles rotate in directions to prevent wheels from 'digging in.' The standard machine will handle gears from 3 to 13 in. OD; other models are available for gears to 20 in. OD. *Michigan Tool Co.*

Circle 43 on postcard for more data

Proximity Switch

A NEWLY designed proximity switch combines the characteristics of the mechanical and proximity type of sensing system.

Containing only one moving part, this switch is 1½ in. wide, 1½ in. deep, and 4½ in. long. Hermetically sealed in a brass housing, it is impervious to coolants, abrasive dust and dirt or temperatures ranging from —50 to 250 deg F. It operates

Switch contains only one moving part

without transistors, tubes, coils, relays or amplifier.

The GEMCO, unlike conventional proximity switch systems, requires no power input, thus avoiding costly installation and maintenance. The initial cost is much less. It is much smaller than the conventional systems. This device has been tested as high as 150 million operations with minor evidence of wear. Its operating life is believed to be unlimited, unless abused. *General Equipment and Mfg. Co.*

Circle 44 on postcard for more data

Transfer Between Machines

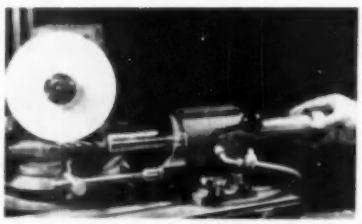
A NEW type of transfer for the automatic transfer from machine to machine of large parts, such as axle shafts and tanks, has been designed. It is said to be a completely new approach to the transfer process for machining, welding and assembling operations. It operates overhead, raising the parts above the machines to index them to succeeding stations.

The basic section of the mechanism is a single "box frame" supported above the production line by several arch-type supports. The frame is cylinder-powered and rides on flanged guide wheels affixed to the arches. *Michigan Tool Co.*

Circle 45 on postcard for more data

Air-Floating Spindle

IT is said a new principle incorporated in the Air-Flo sharpening fixture, for sharpening end mills and routers, operates virtually without spindle friction. The attachment has a porting system that is engineered to eliminate all metal contact of the spindle, which floats on a cushion of air, giving the operator's hand a super-sensitive feel. Compressed air to the unit is supplied by either the



Grinder accomodates shanks up to 1¼ in.

shop compressor or from an inert gas tank.

The improvement in sensitivity or feel by the operator is said to eliminate scrap due to friction jerks. End mills as small as 1/32 in. diameter can be sharpened.

This attachment also grinds either straight or tapered end mills both on periphery and ends. Also ground are routers, shell mills, step drill margins, stagger tooth cutters and specials. The Air-Flo attachment grinds all over, such as: periphery, end teeth, notches, flute faces and corner chamfers, and will handle both left and right hand. *Steptool Corp.*

Circle 46 on postcard for more data

New Hopper Activator

IT is said that a new device will insure reliable flow of dry materials from any hopper or storage bin. Known as the Vibra Screw Hopper Activator it features separate mechanical vibrating and pneumatic mechanisms with universal application to any size hopper and any type of dry material.

The new unit, applicable to many industries, holds particular significance in insuring efficiency in closed-loop processing operations. The principle of this development is to disturb materials by imparting vibrations directly into the mass rather than through the structures where they are stored. This device can handle material from 1 oz to 100 tons per hr. *Vibra Screw Feeders, Inc.*

Circle 47 on postcard for more data

METALS

(*Continued from page 59*)

Production to Resume Slowly

Some progress has been made in settling the long-drawn out copper strikes which have already cost the industry the loss of some 300,000 tons of metal, or about 30 per cent of the usual annual output. By mid-December the San Manuel mine, the country's fourth largest producer, had agreed on a new contract with its workers after a four-month shutdown, but this doesn't mean that any more refined copper will be available until at least the middle of January. American Smelting plants are expected to require at least a month before they will have copper to sell. In short, copper supplies will remain very tight until well into the first quarter of the new year.

Abroad, copper stocks are low and there has been a marked revival of buying on the Continent and on the U. K. Japan is in the market for electro but little is to be had. In this country stocks of copper at the wire fabricating plants, the nations biggest copper consumers are scraping bottom. Brass mills which can use a lower grade metal are not so badly off.

Zinc Statistics Encouraging

The most recent statistics from the Zinc Institute were highly encouraging, indicating another drop in inventories at U. S. smelters of over 15,000 tons which on December 1 totalled no more than a two-months supply at current rate of shipments. By the year end they will probably be equal to less than six weeks demand. Inventories of Special High Grade metal totalled only 19,400 tons and demand from the die casters was good. Deliveries of Prime Western zinc increased nearly 12,000 tons, up to over 77,400 tons for the month, the best figure since June. Production meanwhile was hurt by strikes at the Anaconda mines. When work is resumed it should add upwards of 13,000 tons a month to the national output and consequently ease the shortage of Special High Grade, an Anaconda specialty. But this added supply in any event won't be available until January.

Lead Price May Weaken

Settlement of the strike at the American Smelting plants makes the price situation for lead rather shaky. Business to mid-December has been dull in lead. The 13 cent price has been anything but firm, in contrast with the zinc price. London continues to quote lead about 9 cents a pound equivalent, and a differential as large as this can't last. Asarco has large unsold supplies of lead immediately available. This metal will be added to the already ample supplies on hand. At full capacity Asarco's plants can turn out about 29,000 tons of lead a month. In all likelihood a price cut is on the way. Recent

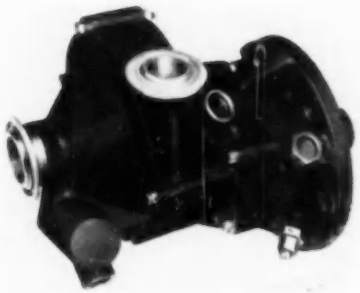
(*Turn to page 66, please*)

NEW PRODUCTS AUTOMOTIVE-AVIATION

FOR ADDITIONAL INFORMATION, please use reply card at back of issue

Water Injection Pumps

Sundyne design water injection pumps are built to operate for 1500 hours between overhauls. Primary factor in the unusually high reliability and long life of these pumps is the elimination of contact seals and grease packed bearings so that Sundyne pumps can run almost indefinitely under dry conditions with a negligible rise in temperature. In addition, elimination of such seals and bearings excludes the possibility of failure induced by sudden high



New pumps handle a variety of fluids

pressures and flows when pumping.

Rated flow of the new pumps is up to 85 gpm, although they can be easily modified for an even greater capacity. They can use either a gearbox power source or be coupled directly to a high-speed drive, and are capable of high pressures in a single stage.

An important characteristic of Sundyne pumps is their metering capability regardless of variations of inlet and discharge pressures, which permits the elimination of pressure regulators and control valves. Also, this pump can be modified to permit the discharge of two metered, predetermined flows, each at a different and predetermined pressure. *Sunstrand Aviation.*

Circle 50 on postcard for more data

Cylinder Port Seals

Port seals, that are said to provide perfect sealing and protection from overtightening, consist of a hexagonal steel nut with a threaded teflon sealing insert. This insert is reported to be impervious to the chemical or corrosive actions of all hydraulic fluids, air, steam, water and gases.

These seals are standard equipment on all standard models of air and hydraulic cylinders, boosters, and accumulators manufactured by the *Miller Fluid power div., Flick-Reedy Corp.*

Circle 51 on postcard for more data

Temperature Indicator

A single unit aircraft servo temperature indicator weighing less than 1.5 lb is now available from the *General Electric Co.*

Improved reliability and sensitivity, stemming from use of transistors and an electromechanical modulator, are features of the new design. Engineers at the Company's Instrument Department, anticipate maintenance free operation of at least 2000 hours.

Designated Type DJ-100, it may be used to measure either pre-turbine or exhaust gas temperatures, depending upon engine requirements, for turbo prop and turbo jet aircraft.

Circle 52 on postcard for more data

Water Demineralizer

A portable water purification and demineralization system for use with supersonic aircraft has been delivered to the Air Force. The first unit, which was delivered immediately after certification tests, will be used as ground support equipment for the F-105 Thunderchief, now in service with Tactical Air Command.

The F-105 dubbed "the world's most powerful one-man airplane," uses water injection to get an extra ton of thrust on initial take-off. It is the first production aircraft to use both afterburner and water injection. It is said this extra thrust is especially important when the jet must take off from limited runway space. *Republic Aviation Corp.*

Circle 53 on postcard for more data

Gearshift Control by Air

Fullair control, the all-air-actuated gear shifting control unit, is now available on three additional heavy-duty transmissions.

This device is a small master control mounted near the driver's right hand, and can now be obtained with the Fuller model 5-C-72, 5-W-74 and 5-C-720 transmissions. It is also available with Fuller's 10-speed model; R-63, RA-63, R-660, RA-660,

Air actuated slave unit gives instant response to master control

R-96, RA-96, R-960 and RA-960 transmissions.

The Fullair control makes remote gear shifting positive and effortless because compressed air does all the work. Movement of the master control's short shift lever through the normal shift pattern, identified on a slotted template, actuates valves, which in turn release compressed air to a slave unit on the transmission. *Fuller Mfg. Co. Transmission Div.*

Circle 54 on postcard for more data

METALS

(*Continued from page* 64)

lead sales have averaged no more than 2300 tons a week and there is no indication that an improvement is in the making. From a production standpoint, any increase abroad in zinc output would bring out a nearly corresponding tonnage of lead that isn't needed today.

Yet demand for lead abroad continues in fairly satisfactory volume although world producers are burdened with high unsold inventories. Statistically lead appears in a better position overseas than in U. S., with 115,000 tons of inventory held by foreign producers, compared with 176,000 tons by domestic producers, and this in spite of a production cutback of some 100,000 tons in the first 10 months of this year in this country. On the other hand, foreign output of lead increased sharply to 933,000 tons from 885,000 tons in the 1958 comparable period.

Skoda Automobile Plant Boosts Production

(*Continued from page* 61)

out a few, East Germany has supplied a number of copying lathes with punch-card control, quite a few internal grinders, and seven 4-spindle bar automatics of 100 mm capacity for gear blanks. The press shop has been equipped mainly with East German Pels machines, and a score of units up to 1000 tons are now in use there. Of Russian manufacture are 18 six-spindle vertical automatics and several hydraulic broaches.

Much of the new equipment, however, is of Czech make. Of principal interest is a pair of automatic transfer lines for the aluminum engine block. The first of these, a 6-station unit, transports the four-cylinder block vertically on its main bearing recesses. At each work position the transfer bar drops to lower the pan face onto the central bed, and the casting is clamped downwards hydro-mechanically. Operations cover drilling, reaming, tapping and deep-hole drilling.

The second 8-station section is a platen-type machine with an overhead return conveyor having worm-driven elevators at each end. The block is horizontally positioned, with hydraulic clamping using an external mechanical drive at the load-unload station. Work includes boring, finish boring and milling. Unusual tooling at the third station on the pan side of the line combines drilling and chamfering the oil pump hole with milling an oil groove, while an independent pair of milling cutters on a pivoted head are guided by a curved track during infeed to undercut the faces adjacent to the central main bearing.

These transfer lines, installed during the past year, were designed by the Machine Tool Research Institute in Prague. This is staffed by 350 engineers and technicians and has the development of such automatic equipment as one of its main tasks. All basic components are standardized in a limited range of sizes, and manufacture is concentrated at the TOS (formerly Zbrojovka) factory in Kurim. Capacity at this factory is being increased rapidly to meet the growing demand in Czechoslovakia, and one transfer line has already been exported to SKF in Sweden.

An older automatic line which has been in operation for nearly three years is a simple six-station unit for machining valve guide bores in the cylinder head. A number of semi-automatic single machines of Czech manufacture are also in use, among them a double-ended drum-type unit for milling and turning universal joint spiders in three double stations, several multi-spindle fine borers, and a number of rotary indexing machines for differential casings and other components.

Parenthetically, Mlada Boleslav is probably unsurpassed as a place to view a wide variety of Communist machines on actual production work, not just at exhibitions, and to evaluate their performance on the experience of engineers and operators rather than on the opinions of salesmen. It also makes possible a direct comparison between them and West European machines on similar jobs, as, for instance, East German and Swiss copying lathes doing identical work.

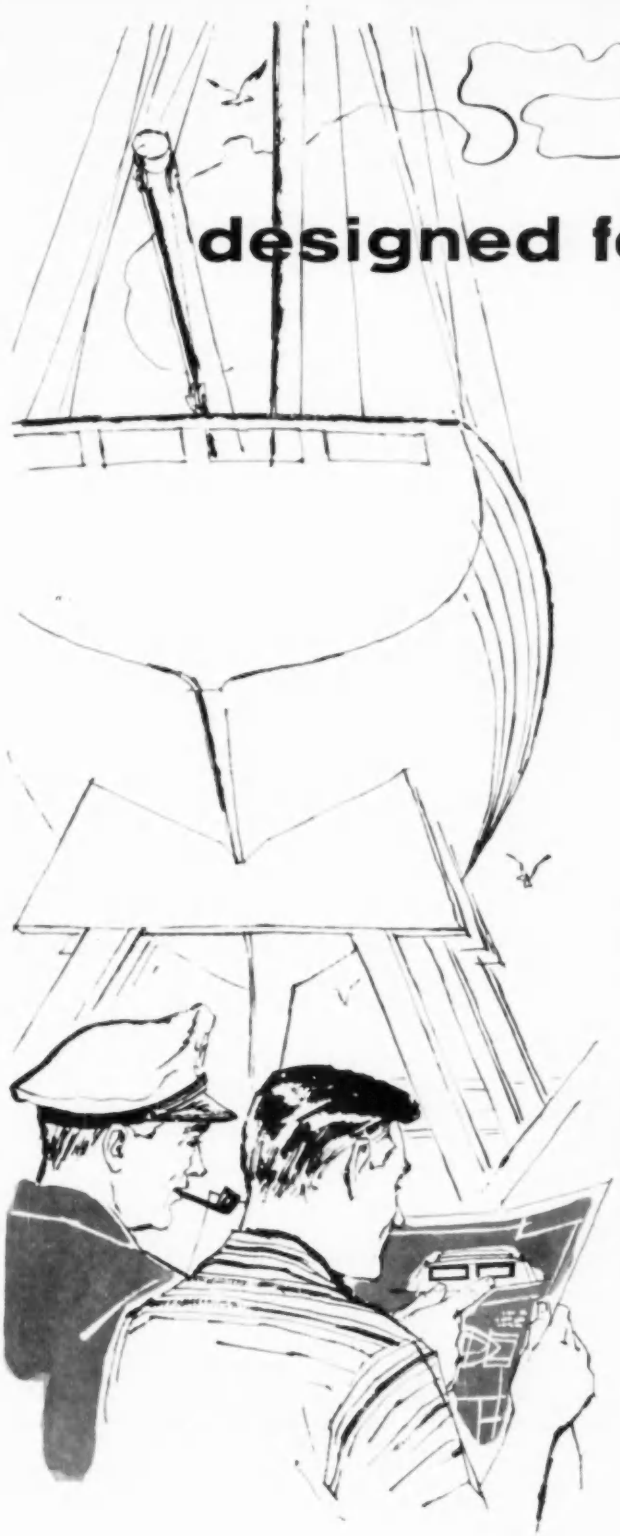
Aside from metal-cutting machines there is a considerable amount of special production equipment made at the Skoda factory itself. For example, final drive units are manually assembled on a 10-position machine with fixtures carried on a vertical conveyor that indexes around the loop circuit. Stations are equipped with hydraulic presses and power tools as required, and pinion, crown wheel, differential and other parts are progressively added.

Many of the welding jigs are made locally, including a pair of roll-over fixtures near the end of the final body line that give the operators unimpeded access to all sides of the assembled shell. The newest and most ambitious home-made installation is an initial body paint tunnel for degreasing and rotary dipping to apply the primary coat.

But a great deal of this new equipment is grossly under-utilized. For example, the Hüller transfer line meets the full daily quota for gearboxes in only four hours. Similarly, the cylinder block lines are idle most of the time. Production is held up by bottlenecks in the form of outdated machinery, by an excess of manual operations, and by weak spots in materials handling.

Working alongside the modern tools are many relics as much as 40 years old, like some Gleason gear cutters and Herbert capstan lathes *circa* 1920. The main problem at the Skoda plant is that its origins go back 60 years, to 1899 when the firm of Laurin & Klement built their first car there.

The factory was gradually extended, but never on a flow-production basis, not even during the German occupation of the country in the last war. In the early 1950s, when the Communist planners formulated the modernization pro-



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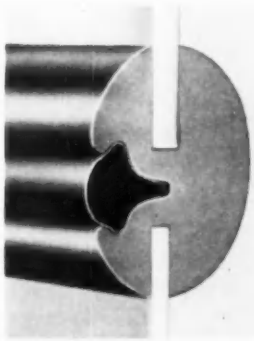
and best 7 ways



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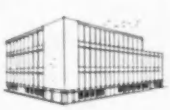
Commercial Structures

Circle 124 on Inquiry Card for more data

gram, it was difficult to buy equipment of any kind from the West because of the export embargo. Skoda thus had to depend entirely on domestic machinery and on imports from Russia and East Germany.

While this self-reliance was a great impetus to the machine tool industries of the Soviet bloc, forcing them to expand the volume and range of their production, the quantity and variety of special-purpose types of machines were inadequate. Only when the export restrictions were relaxed a few years ago was Skoda able to get suitable equipment from the West, and it is now in the process of replacing 80 per cent of the plant, while so-far-neglected links in the chain continue in operation.

Thus considering the scale of new investment, the daily production of only 300 cars planned for 1963 suggests an amortization period that no private enterprise manufacturer could accept. But this is a nationalized industry in a planned economy, and within such a framework the Czechs are prepared to subsidize one enterprise from the profits of more efficient ones.

Another handicap afflicting the Skoda plant is an uneconomic degree of self-sufficiency similar to that seen by the writer in Russian and Polish automobile factories. Czechoslovakia has virtually no specialist manufacturers of stampings, axles and other basic components, not to mention parts like brakes, clutches and valves.

Skoda is therefore compelled to make a very high proportion of the required components locally in small quantities at considerable cost in terms of equipment and manpower. It cannot benefit from the volume production of outside suppliers as do most western firms, and its labor force of 10,000 working on two (in some sections three) shifts is spread thinly to cover a multitude of short-run jobs.

In addition, Skoda is striving to improve the reliability and reputation of its car through more rigid inspection and quality control—operations that drain off more man-hours from the meager supply. As an illustration, every completed engine is run on a test bed for at least one hour, after which the oil pan is removed and the bearings checked and adjusted. Cars are then individually road-tested for 15 or 20 miles.

Although the economics of the Skoda plant are open to question, the Czechs are determined to build up their automobile industry, apparently regardless of the initial cost. Aside from hoping eventually to meet the pent-up demand at home, they regard the car as a sure-fire export commodity capable of earning much-needed foreign currency, and half the production is now being sold abroad. And on the political side, the automobile is viewed as a symbol of economic achievement, so for prestige purposes they want to keep the name Skoda on the roads of the world. ■

Reliability Emphasized at Vickers Hydraulic Conference

(*Continued from page 52*)

continental glide missile will require about 10 hp, while some manned re-entry glide vehicles will require 20 hp for aerodynamic controls.

Costs involved in power systems for space vehicles are staggering. For example, although some systems that have promise for the designer are still in their formative stages, in the case of a chemically-fueled system the full cost of development will be around $5 million while a nuclear system, tailored to a specific vehicle could cost as much as $100 million.

This factor alone may force a designer to select equipment that is technically less desirable but with development costs already absorbed in another space vehicle.

Curran points out that a specialist like Boeing must be in position to list specifically the power equipment considered optimum for future space vehicles. At the present time this cannot be done since it is impossible to select a system until a complete analysis of the problem and its possible solution has been made. Non-propulsive power equipment cannot be selected on the basis of weight alone since such factors as volume, cost, availability, and effects must be evaluated. Consequently, for some time the designer must be content with the following available systems:

Battery
Chemically-fueled open cycle
Solar photovoltaic
Nuclear
Fuel Cell
Solar thermionic
Solar thermoelectric
Solar dynamic conversion

Some projected systems that show promise but are not yet competitive are listed below:

Closed-cycle chemically fueled systems present problems that outweigh their possible advantages and cannot be given any consideration today.

Contributing to advance in hydraulic elements, Vickers presented reports on the design and use of ductile iron cylinder blocks; and recent improvements in the fixed angle variable displacement pump. Another noteworthy development is the Vickers contamination-tolerant pump which is being produced for military aircraft. It is specifically designed so as to be unaffected by contaminants, giving unusually long life under adverse conditions. Paradoxically, it appears that this type of pump can also serve as a non-contaminant pump because it will not add contamination in a given system.

Some of the airline operators showed considerable interest in the contaminant tolerant pump despite its obviously higher cost.

Summarizing the discussion of immediate problems presented by airline operators, it is obvious that hydraulic leaks still remain a major problem. It implies that continuing work must be done on the design as well as the materials best suited for dynamic seals. There is also an indication that further improvements must be made in the design and selection of materials for high pressure hoses, operating at higher temperature levels. ■

ANNOUNCING NEW HEAVY DUTY 6" AND 8" HICYCLE GRINDERS

Heavy Duty Hicycle Angle Grinder with rotating wheel guard.

Heavy Duty Hicycle Angle Sander with 9" pad.

Model CP-550-SG-4500 Heavy Duty Grinder maintains speed under load, lets the operator really lean into the work.

Here are two *all new* CP heavy duty Hicycle Grinders . . . brutes for power, demons for speed. Hicycle squirrel-cage induction motors running on 180 cycles, 220 volt, 3 phase current provide Built-in Overspeed Protection because maximum speed is always constant, always within safe wheel limits . . . speed sag under load is less than 15%.

New with these models is the CP *"Tri-Flo" Cooling* System that minimizes "hot spots". This highly efficient system cools motor windings, rotor shaft, main bearings, gear case and switch. Keeps the temperature rise at key points as much as 28° lower than with conventional type cooling.

You get these 7 extra advantages with CP Hicycle Grinders

1–*Hicycle Motor* of advanced squirrel-cage design means no brushes to replace, no armature to burn out. 2–*Power/Weight Ratio* is outstanding because high strength magnesium castings are used for motor, gear case and switch handle. 3–*Oil Sealed Ball Bearings* lubricated for life. 4–*Interchangeable* motors, motor housings, switch handles and switches on all straight and angle models. 5–*Heavy-duty switches* have dust tight seals and phenolic spacers for insulation from motor and to minimize vibration. 6–*Extra heavy micro-mesh gearing* heat-treated for long service. 7–*Guards* fully conforming to A. S. A. safety codes.

Write for complete information on these newest CP Hicycle Heavy Duty Grinders. Chicago Pneumatic Tool Company, 8 East 44th Street, New York 17, N. Y.

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OSBORN

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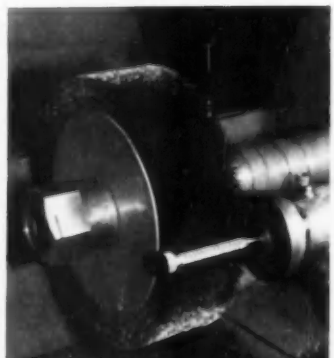
Close-up of leaded steel cog roller shows burrs... heat-treat scale... sharp edges. Off-hand finishing time: **2 minutes.**

AFTER BRUSHING
Burrs and scale completely removed...all edges and grooves uniformly blended. Osborn 3-A Finishing Machine cycle time—including handling time: **40 seconds.**

Phone parts finished at 90-an-hour clip

...superior quality 3 times faster with OSBORN Power Brushing



TELEPHONE SWITCH PARTS are automatically finished to exacting specifications. This efficient Osborn 3-A Metal Finishing Machine—using Osborn Monitor Brushes—deburrs and finishes lots of 2000 to 4000 parts *better and 3 times faster* than former method.

These are cog rollers—vital parts of telephone switches made by a leading manufacturer of electronic and communications equipment. Properly finishing these components means thorough deburring plus removal of heat-treat scale and sharp edges.

Hand scraping and off-hand methods were slow—took 2 minutes per part—rejection rate was high and costly.

Today, an Osborn 3-A Metal Finishing Machine does the job 3 times as fast—just 40 seconds per part including handling time—and saves 2000 hours a year on this one part alone. *Plus values:* high, uniform quality . . . rejects eliminated.

This Osborn finishing application is typical of how *you* can pinpoint savings, too. An **O**sborn **B**rushing **A**nalysis—made in your plant now at no cost or obligation—is the first step. Write us for full details. *The Osborn Manufacturing Company, Dept. E-85, Cleveland 14, Ohio.*

Osborn Brushes

METAL FINISHING MACHINES . . . AND FINISHING METHODS
POWER, PAINT AND MAINTENANCE BRUSHES • FOUNDRY PRODUCTION MACHINERY

SHORTIES

Mail from New York to Los Angeles by air arrives ahead of mail from San Francisco to Los Angeles carried by rail.

●

Asian countries are rapidly "moving up" from foot and ox cart to automobile transportation. Asia increased its registration of cars, trucks and buses by 3,465,107 during 1958, for a gain of 21.8 per cent.

●

Big, ocean-going tankers can load petroleum and its products at the rate of 40,000 barrels an hour—enough to supply the daily requirements of a medium-sized refinery.

●

In 1960 motorists may chalk up 700 billion miles of driving on business and pleasure trips.

●

The 1959 steel-making capacity of 147.6 million net tons was great enough to provide a record 1,681 pounds of raw steel for every person in the continental United States. That amount is 44 pounds per capita more than in 1958.

●

Approximately 85 per cent of the transport aircraft operated by the world's airlines belonging to the International Air Transport Association were manufactured in the U. S.

●

The pre-cooked "TV" frozen dinner was originally developed by the Air Force as a solution to feeding bomber crews on missions lasting as long as two days.

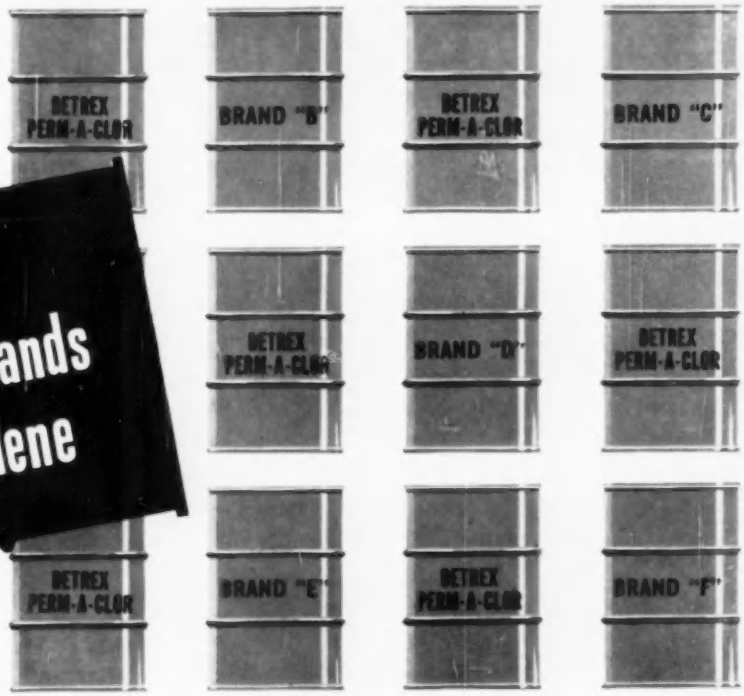
●

Foreign countries received the equivalent of nearly $4.6 billion in dollars, foreign currencies, goods and services in fiscal 1959 under the several U. S. programs providing grants and long and short-term credits abroad.

●

Corporations added $25 billion to their physical and financial assets in the first six months of 1959, a record rate for that time of year.

Circle 126 on Inquiry Card for more data



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Combine PERM-A-CLOR with DETREX tailored-to-the-job equipment, and even greater efficiencies are realized. Operating costs are reduced, worker productivity is increased, more parts are cleaned per pound of solvent.

Now add the DETREX engineering organization – men most qualified to analyze and appraise the efficiency of metal cleaning operations – and you have another important reason why PERM-A-CLOR users get the most for their solvent dollar.

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- PAINTBOND Compounds
- Aluminum Treating Compounds
- Alkali and Emulsion Cleaners
- Rust Proofing Materials
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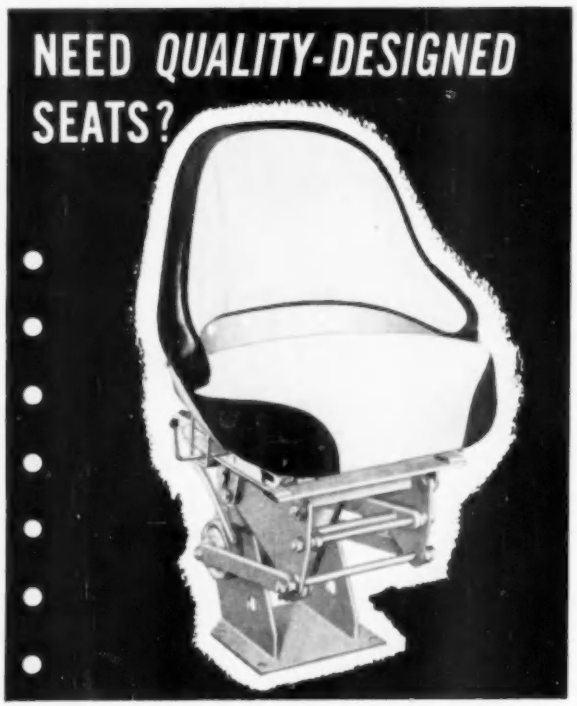

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Cities should invest in "more economical and efficient" rapid transit systems, instead of strangling themselves with new freeways. Hilliard N. Goodman, executive vice-president of the Citizens Transit Improvement Association, contends.

He says many new suburban freeways "are obsolete the minute they are opened." They create more traffic than they can handle and thus hurt rather than help the suburban commuting problem.

Government stockpiles of industrial materials continue to shrink. It's part of a program to get out from under some storage costs. Also, Washington planners are beginning to realize that much of the commodities now in stockpiles probably won't ever be needed in warfare of the future.

Lower taxes are a good possibility. It all depends upon the state of U. S. business activity in the year ahead. Healthy sales activity would stimulate tax collections and thus open the door to cuts. Chairman Wilbur D. Mills, D., Ark., of the House Ways and Means Committee, is paving the way to long-overdue tax reform via the public hearings he's holding this year.

President Eisenhower's plan for creating two new top jobs in Washington looks like a winner with Congress. Ike wants a First Secretary of Government, who'd set foreign policy, and a Business Manager in the White House, who'd be authorized to make final decisions on many domestic matters. Basic motive is to free the President from detail.

State governors fret over the slower flow of road money from Washington. They urge that funds be kept coming, even though tax collections don't warrant it. Grumbling is widespread, so President Eisenhower may have to call a special conference of state officials to reassure them that Federal aid to highways is not coming to a stop.

Union officials are red-faced over the way rank-and-file union members are seeking protection of the new national labor reform law. (Union heads had assured workers the law was a "killer.") Most of the complaints filed in Washington involve charges of stealing, fake elections, or intimidation of workers. It's increasingly clear why some union heads tried to stop the new law.

General Motors announces a new name for its Moraine Products Division

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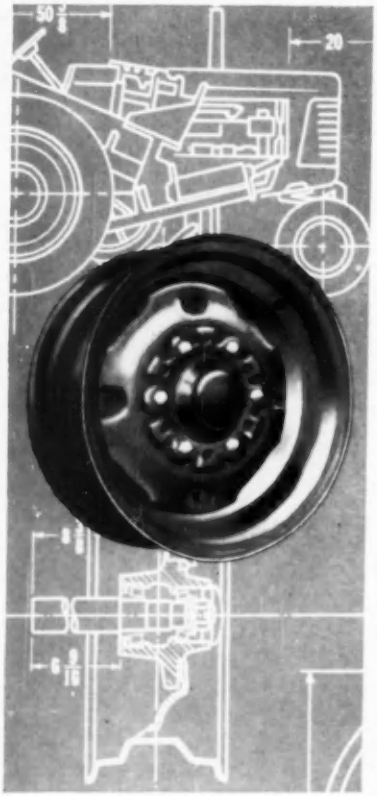

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DUCTILE IRON

(*Continued from page* 51)

heavy-duty and military vehicles.

Some characteristics of ductile iron make the use of lighter designs logical. This is done to compensate for the lower thermal conductivity of the material (when compared to gray iron) and to take advantage of the much greater strength. Provision of cooling ribs is also advantageous.

Die Applications

An industry, not only allied but almost entirely dependent upon the automotive industry, is the die industry. This is that portion of the foundry business devoted exclusively to the production of dies used in the manufacture of the various body components.

The first large die for production use was made in 1956. It was a $6000 ductile iron casting which replaced a gray iron die, into which air hardened tool steel inserts were fitted. A 32,000-lb ductile iron die, cast integral with the shoe, served as a replacement for the more expensive tool which would fail by cracking one of the tool steel inserts.

The original shoe plus the air hardened inserts, cost approximately $80,000. The ductile iron die was ready for use after an expenditure of only $40,000. This particular die served as a bottom die in a 1600 ton "Clearing" press producing automobile bumpers.

All working surfaces were flame hardened to a Rockwell C 58-60. This was achieved with one pass, air quench. The customer insisted upon this quick reaction and has since standardized the procedure so that hardening is done at the point of use.

Since this first use of a ductile iron die by the automotive industry, ductile iron has proven itself many times over. All the major producers now accept and have written specifications covering this family of engineering materials.

It has replaced in various categories of use and in varying amounts, gray iron, alloyed gray iron, and steel. At least one company has now specified ferritic ductile iron for all die shoes and pearlitic ductile iron for dies with working surfaces.

The die industry is a dynamic one, and every effort is being made to utilize new methods of molding. Castings within 0.090 in. of finished dimension over a five ft distance are made without difficulty.

The combination of ductile iron with such precise founding processes is a natural one that can reduce total die costs of the automotive manufacturer by at least 50 per cent. Reduced machine time is the cost factor that will be most affected.

Looking to the Future

The economy of the U. S., and perhaps to a lesser degree the economy of Europe, is closely tied to the automotive industry. The demand for automobiles will continue to grow at a steady rate in the years ahead. Power plants with the lowest weight per horsepower at comparable strength levels must be developed for cars of the future.

Ductile iron is a natural material to use when removing weight from the largest single component of the automotive engine—the cylinder block.

The cylinder head, designed with thinner sections, is the perfect mate to the ductile iron block. Through proper redesign to achieve maximum heat transfer, this will also take pounds off the power plant and still allow for the operation demanded.

It is possible that pistons made from ductile iron will become commonplace. This would complement the use of ductile iron as a cylinder wall liner currently used in Europe in very heavy applications.

Bearing caps made from ductile iron are a natural combination of components when used in conjunction with the cylinder block. In this application, it is necessary to have components of equal strength to minimize the possibility of failure.

Crankshafts, camshafts, and connecting rods are parts where two fabricating methods that heretofore have been competitors can be combined. It is possible to produce a finished product in a minimum of operations by precise molding,

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WHY MICROHONING* of Valve Tappet Bores Assures Economical Production, Precision and Functional Surfaces

Johnson Products, Inc., (Muskegon, Michigan) is a pioneer in the manufacturing of hydraulic valve tappets. Placing strong emphasis on quality control, they demand consistent precision and geometric accuracy. Here's why Johnson engineers insist on using the Microhoning process.

Typical Johnson valve tappet — cross section shows interrupted, semi-blind-end bore.

Generates Clean-Cut Surfaces

Microhoning is a low-velocity abrading process that uses a combination of controlled speeds, feeds and motions to provide functional surfaces. Also, the large area of contact between abrasive and work surface spreads and easily dissipates the cutting heat. Thus, Microhoning generates clean-cut work surfaces that are free of burned or smeared metal.

Produces Longer-Wearing Surfaces

Because the Microhoned surface is cleared of amorphous material, it is in the base metal zone where longer-wear characteristics are more readily induced. Also, the unique Microhoning cross-hatch lay pattern provides a multitude of minute "plateaus" for equitable distribution of work load.

Two of the double-spindle Hydrohoners, each spindle has its own sizing control.

Functional Accuracy

Geometric accuracy is mandatory! For, there must be a clearance of .0002"-.0003" between tappet bore and its plunger. Microhoning consistently holds bores within the .00003" tolerance for roundness and straightness, and within .0005" for size. Proof—each tappet assembly must pass a critical "leak-down" test.

Processing Economy

In a typical production run of 31,250 parts, scrap was only three-tenths of 1%. This is a striking example of economy resulting from consistent quality processing. The use of Microhoning also eliminated previously required precision boring — several boring machines were involved in this saving.

*Registered U.S. Pat. Off.

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hot coining, and only a finish grind to furnish a completed part. Ductile iron is highly compatible with the precise molding techniques and can be hot worked.

The first step in the acceptance of ductile iron as a hub and brake drum material by the American automotive industry has been taken. Ductile iron brake drums have been poured, machined, and tested on dynamometers.

The automatic transmission has added weight to the automobile which up to now has only been removed by aluminum. The use of ductile iron, combined with precise molding and redesign of the part for thinner sections, will result in the same savings.

These are but a few of the areas where ductile iron will find use in the future. Experimental programs are underway to develop data to validate the findings of European experience.

In the past, ductile iron has not truly offered competition to other materials because of costs and the state of the art as related to producing spheroidal graphite. This is no longer true.

Through the use of new techniques of treatment, new alloys, closer control of melting equipment, the price differential is being narrowed rapidly. Already, we have foundries producing ductile iron at lower cost than malleable iron. In addition, ductile iron is less sensitive to section size than malleable and has greater foundability and machinability.

The future for ductile iron in the automotive industry is one with unlimited possibilities. There is a definite need for a material with some or all of the characteristics of ductile iron. In combination with precise molding techniques, ductile iron can do much to make it possible to design to lower weights with equivalent or better strength and with equipment presently in use. ■

REFERENCE

Bogart, H. W. *Shell Molded Crankshafts*, SAE paper, Jan. 14-18, 1957.

The foregoing is a condensation of a paper presented by the author as Lecture No. 24 in a Technology of Ductile Iron Course at New York University, July 3, 1959.

New Horizons in METAL FINISHING

(*Continued from page 49*)

treated are produced dry and ready for "on-the-spot" processing. No drying operation is required, and the compact equipment that is used requires relatively little floor space.

Furthermore, the combination of vapor degreasing with phosphatizing, enables solvent economies. Savings as high as 40 per cent are possible in initial investment, floor space, and operating costs. Maximum economy is obtained when the degreasing-phosphatizing unit is integrated with a painting setup into a three-stage, in-line system. Paint, thinned by tricholoroethylene, can be applied either by dipping or by the new "Spray-in Vapor" process announced by Du Pont in 1958; little additional solvent is required.

Even though the phosphating process is operated at the boiling point of the solution, utility consumption is quite low. As a matter of fact, steam consumption represents one of the major areas of savings over the water-based process. This saving results from the very low heat of vaporization of trichloroethylene; 103 Btu/lb, as compared to 970 Btu/lb for converting water to steam. Including the elimination of heat required in a dry-off oven, reductions in utilities costs on the order of 80 per cent are projected for the new process.

In addition to improved paint adhesion and corrosion resistance, a certain degree of rust resistance is developed on the phosphatized steel part. This "in-process" rust resistance imparted by the "Triclene" phosphatizing process is of particular value in operations where there is storage between phosphatizing and painting or where paint is not applied to the entire part.

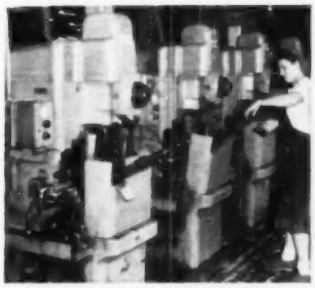
Equipment

Equipment for the new anhydrous phosphatizing process is similar in construction to vapor degreasing equipment. A U-bend de-

HOW MICROHONING of Valve Tappet Bores Generates Accuracy Within .00003", Eliminates Boring, Cuts Scrap Losses

To obtain functional surface qualities, engineers at Johnson Products, Inc. are insisting on Microhoning the bores of hydraulic valve tappets designed for long service or punishing usage. In addition, here is how Microhoning also generates consistently high accuracy, eliminates an extra operation and reduces scrap losses to a minimum.

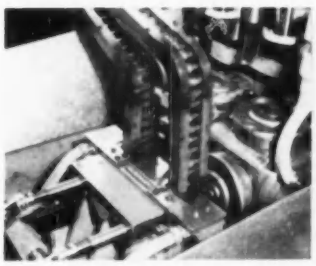
Automatic, Consistent Precision



Pictured is a line of four Model 738 Microhoners that typify the Microhoning equipment used by Johnson Products. Each machine has: automatic stonefeed and stonewear compensation (Microdial); automatic sizing unit (Gage Ring Air-Switch Microsize); air operated raising and lowering of fixture table assembly is synchronized with head controls for automatic operation.

Result: Johnson automatically obtains consistent precision as evidenced by these several facts. Microhoned bores are held within .00003" tolerance for roundness and straightness, within .0005" for size, and a specified surface finish of 12-14 microinches (rms) is generated. Also, from a typical production run of 31,250 parts, only three-tenths of 1% was scrap—a striking example of processing control and low scrap loss.

Flexible and Efficient Processing



Bore diameters of Microhoned tappets range from .656" to .800", and lengths from 1" to 2". Material is either cast iron, or iron alloy hardened to 55-60 R "C". In all, 15 different combinations of sizes and materials are Microhoned. Typical fixturing is shown to the right—it is designed to keep changeover time at a minimum.

From .004" to .005" stock is removed during the Microhoning cycle of 18 to 21 seconds. Cutting efficiency is boosted by the design of special Micromold tools. Intraflow features (within the tools) supply coolant directly to cutting zone.

We will gladly send more information on the Microhoning process and equipment—
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greaser/phosphatizer is shown in Fig. 2. This system, fitted with a monorail conveyor, is arranged so that the work passes through a standard vapor degreaser, makes a 180 deg turn, and returns through the spray phosphatizer.

This type of equipment design would be preferred where floor space is at a premium or the U-bend feature fits in well with an existing conveyor arrangement. Alternatively, two monorail units can be arranged in line or at an angle to each other, depending upon individual layout requirements.

Manual operation in open tank units is also practical and is generally preferred in cases where the workpieces are large and relatively few in number. Automated operation can be achieved in these tank units by use of a cycle-controlled hoist or a plating-type conveyor. The cross-rod principle of degreaser design also can be adapted to the process.

Stainless steel is used as the material of construction for equipment in contact with the solution since mild steel or zinc-clad steel would receive a phosphate coating.

Future Developments

In addition to field development work, laboratory studies are continuing on the new "dry" phosphatizing process. Prime objective is to define completely all of the coating's performance properties. It is quite probable that all of the unusual characteristics and applications of anhydrous phosphatizing have not yet been discovered. For example, the mechanism by which the coating imparts a high degree of solvent resistance to a painted surface is not yet fully understood.

There are other possible uses, beyond that as a paint substrate, for the phosphate coating on both steel and non-ferrous metals. For example, phosphate coatings are widely used as lubricants for deep-drawing and break-in operations. Evaluation of the anhydrous phosphate coatings for these applications is planned.

CONCLUSION

Industrial finishing of metal is a mammoth enterprise. It is estimated that 150 million gal of paint, worth more than $500 million, are used annually for the painting of new work alone. Several improved painting methods such as dipping, flow-coating, electrostatic spraying, and the aforementioned "Triclene" trichloroethylene painting processes are finding increasing use in this field.

The advent of the complete "Triclene" finishing system, combining vapor degreasing, dry phosphatizing, and nonflammable painting in one compact unit, is a new milestone in the progress of metal finishing progress. Beauty of the system is its flexibility and versatility. All three processes can be used in various combinations or incorporated singly into present finishing systems. Various dip or spray cycles can be selected for each of the processes, and they can be used on large and small finishing operations. ■

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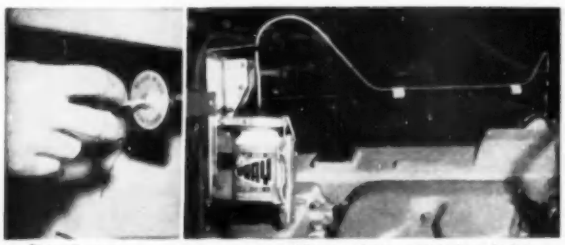

*Patent Pending ▲A cover, not shown, protects the mechanism.

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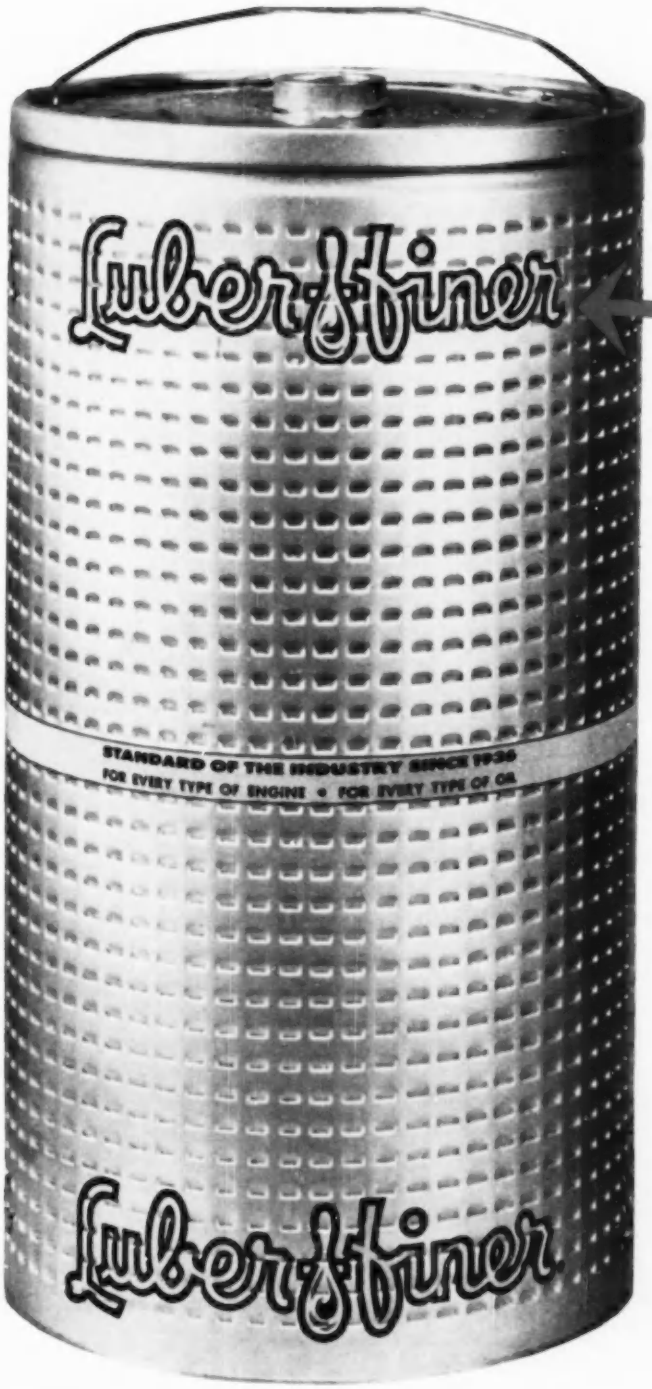

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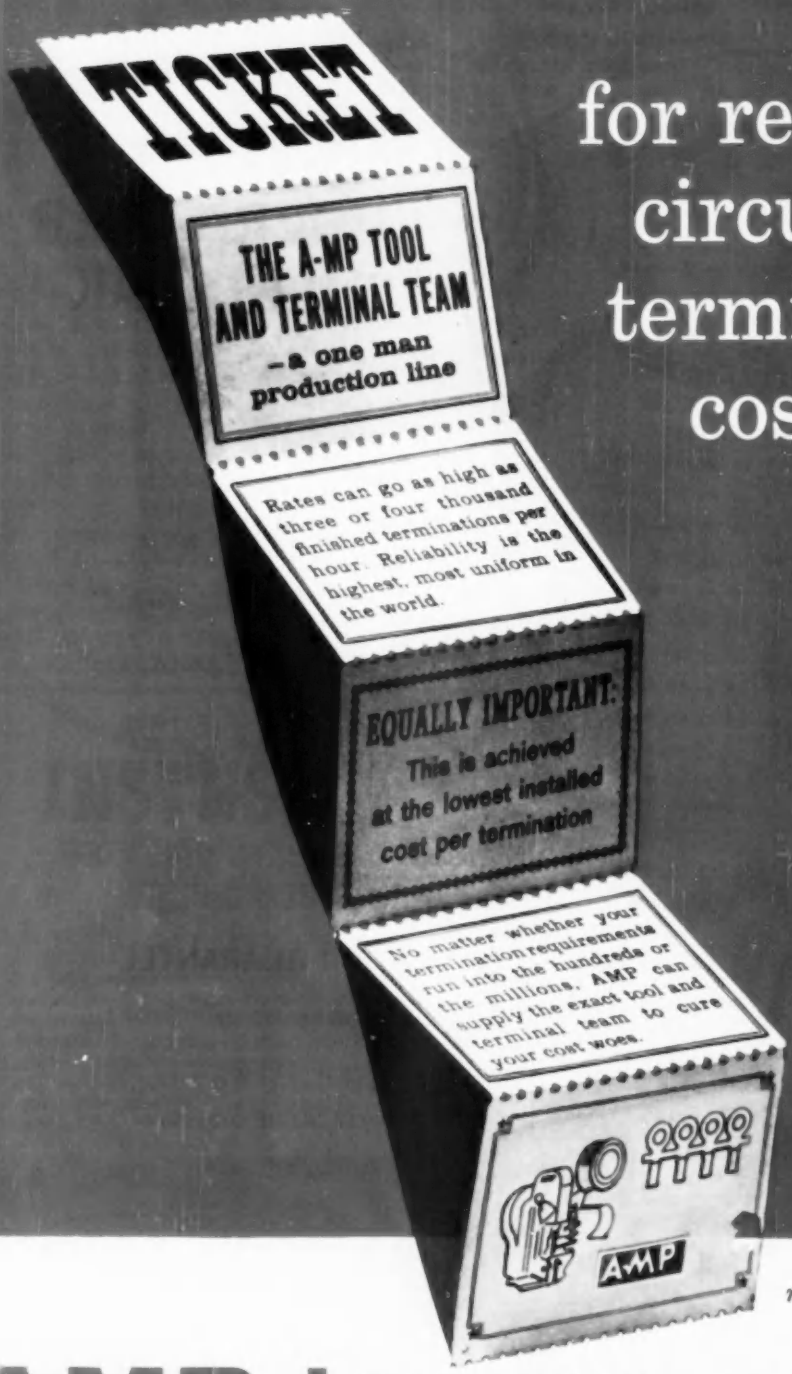
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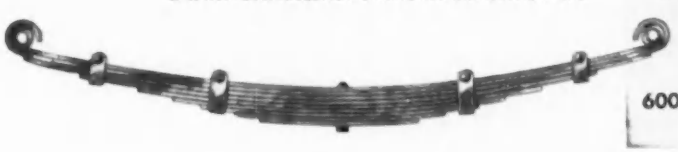

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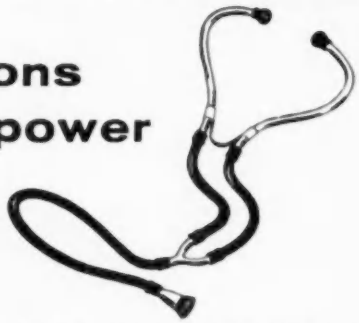

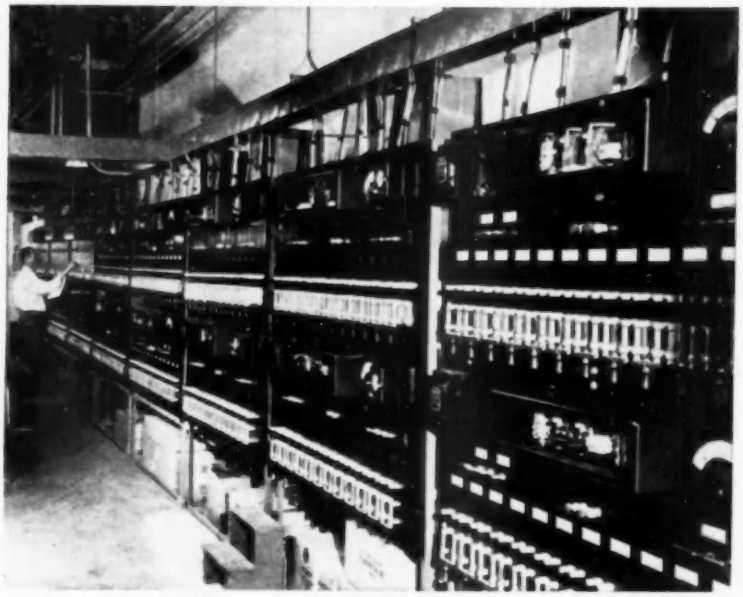

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AIRBRIEFS

By R. RAYMOND KAY

Hot ruble warfare in the aviation industry is shaping up. On August 15, 1958, AUTOMOTIVE INDUSTRIES "Airbriefs," page 90, predicted a Russian attempt to undersell this country in the world airline market.

Now the picture is even clearer. Aeroflot, Soviet airline, will fight in every phase of civil aviation.

That's the word from a man who should know. James T. Pyle, deputy administrator of the Federal Aviation Agency, says that the Russians "will be scrambling for passengers, freight, aircraft sales and rentals. And they'll be trying to move into every pocket of the globe—including our own United States."

What can American aviation do about it? Here are some of Mr. Pyle's suggestions:

(1) Develop a better sales approach. This should include low down payments and loans for foreign buyers of planes.

(2) Write manuals in the buyer's language.

(3) Make it easy to get spare parts, communication and navigation aids.

(4) Step up the quality of training foreign pilots and technicians.

Increasing Military Market

Boeing, one of the country's top defense contractors, believes the military market will skyrocket from $41 billion in 1960 to $63 billion in 1975.

Other Boeing forecasts: (1) Missile spending will be the biggest item on the Army's procurement list. (2) The Navy will buy aircraft and missiles, but the big money will go for submarines and other vessels. (3) The military market's biggest customer will still be the Air Force. Missile money for USAF will rise sharply.

Ordnance Contracts

Stretchouts, cutbacks, and cancellations in the aircraft-missile industry. These begin to look like a repeat performance of the 1957-58 budget-pinching days. And they're hurting big and small subcontractors.

If you're feeling the pinch, here's a suggestion. How about going after ordnance work? On the West Coast alone, firms are sitting with a $1.8 billion backlog in ordnance contracts. And they'll get another $1½ billion of new orders in 1960.

Electrical Failures

Modern military aircraft travel twice the speed of sound. But they still suffer from short circuits and stray voltage—the same old bugs that have plagued automobiles since the Model T days.

Miles of wiring in today's jets make it a must to get rid of the electrical bugs. It's a critical problem. Military and industry experts have their heads together. Here's the picture as they see it.

Where are the most frequent failures? Generators, wiring, batteries. Then inverters, relays, circuit breakers, switches, constant speed drives, rectifiers, and wiring hardware.

Why the breakdowns? Materiel failures and maintenance, in that order. That's what a study of electrical system accidents came up with, according to Brigadier General Walter E. Arnold, Air Force Director of Flight and Missile Safety Research.

What to do about it? Increase reliability through improved quality control.

Brief Airbriefs

Aircraft manufacturing employment will drop sharply in the next five years . . . Target date for the first Dyna-Soar flight is 1962; for the B-70, 1963. . . .

Boeing claims a major breakthrough in the ramjet engine field. It's a unit that could propel a plane or missile 11,000 mph. That's 16 times the speed of sound. . . .

Douglas and Boeing are in a furious race to sell their jet-liners. Boeing needs orders for 50 more before it can show a profit. . . . Planemakers are trying to keep more work "in the house" rather than subcontracting it.

Britain expects to make a "flying bicycle" with blow-up wings. That's the news from the Royal Aircraft Establishment in Farnborough.

If it works, it will be the first in Britain capable of taking off and flying solely on the power of its pedal-pushing pilot. Aim: To get real unassisted man-powered flight.

Are you doing business around the world? Within a year, there'll be an executive jet transport for you.

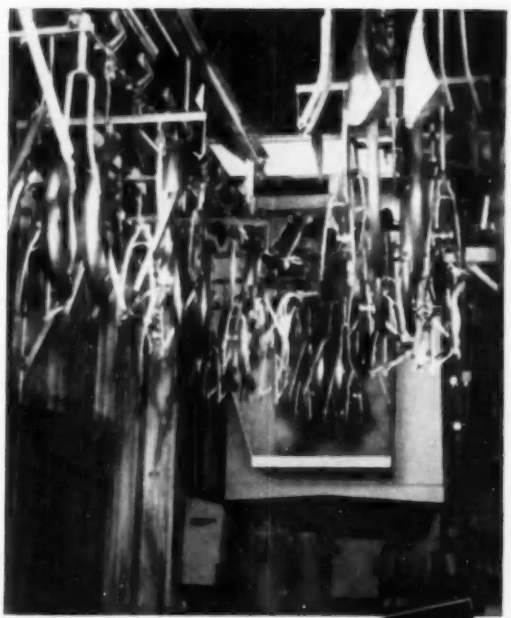
Lockheed says that its Jetstar will be ready by next July. The plane will cruise at 550 mph. And it will match the flight times of airline jets.

The Jetstar, the company says, makes real sense for corporations with world-wide branches. It will have four-engine dependability and the needed range for going anywhere. ■

AUTOMOTIVE INDUSTRIES KEEPS YOU INFORMED

FINISHING SYSTEMS...

Self-Housed Equipment Installed on Roof Saves Over 10,000 Sq. Ft. of Manufacturing Floor Space!



Over a period of twenty-three years the Mahon company has worked in close cooperation with Arnold, Schwinn & Co., manufacturers of famous Schwinn Bicycles, in developing finishing equipment which now produces what is acknowledged the highest quality finish, the most durable finish, and the finest appearing finish in the industry.

The three Finishing Systems installed by Mahon in the past twenty-three years have saved Arnold, Schwinn & Co. over 10,000 Sq. Ft. of valuable manufacturing floor space inside the company's two-story plant. In the first Finishing System, installed in **1936**, only the Spray Booths were located inside the plant; other units, including two Finish Baking Ovens together with Heating Equipment, Recirculating Fans, etc., were housed on the roof.

In **1950**, another complete self-housed Prime-Coat Finishing System, shown above, was installed in its entirety on the roof—the design being a two-level arrangement with Dry-Off Oven, Finish Baking Oven and Heating Equipment Room on the upper level. This System handles Cleaning, Rust Proofing and Prime Coating of all parts produced which receive their 2nd and 3rd or final coat in the other two Finishing Systems.

In **1956**, a third Finishing System was installed with 2nd Coat Finish Baking Oven, Cooling Area, 3rd or Final Coat Finish Baking Oven and Heating Equipment Room located on the Roof. Electrostatic Spray Booths for this System were located on the second floor of the plant directly below.

When you consider buying a new finishing system, or any unit of finishing or processing equipment, you, too, will want to discuss methods, equipment requirements and possible production layouts with Mahon engineers . . . you'll find them better qualified to advise you, and better qualified to do the initial planning and engineering which plays such an important role in the ultimate operating efficiency of specially designed equipment of this type.

See Sweet's Plant Engineering File for Information and Representative Installations, or Write for Catalogue A-660

THE R. C. MAHON COMPANY • Detroit 34, Michigan

Sales-Engineering Offices in Detroit, New York, Chicago, Los Angeles and San Francisco

. . . the **EXPERIENCE** that goes into the **PLANNING** and **ENGINEERING** of **MAHON EQUIPMENT** is the item of **GREATEST VALUE to YOU!**

MAHON

"Man...that Stainless Shines!"

The indestructible luster of stainless steel wheel covers is unmistakable. Stainless is the *one* metal that never betrays a car's mileage . . . or age. The highway's abrasive grit, winter's salted streets, and even harsh detergents and steam can't corrode, etch or dim its beauty.

High quality Uniloy Stainless Steel, now being produced in one of the world's most modern mills, is rolled to your exact specifications. Specify Uniloy Stainless Steel for automotive trim that stays showroom new—forms and fabricates to the designers will.

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STAINLESS STEELS

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STEEL CORPORATION
BRIDGEVILLE, PA.

STAINLESS STEELS • TOOL STEELS • HIGH TEMPERATURE METALS

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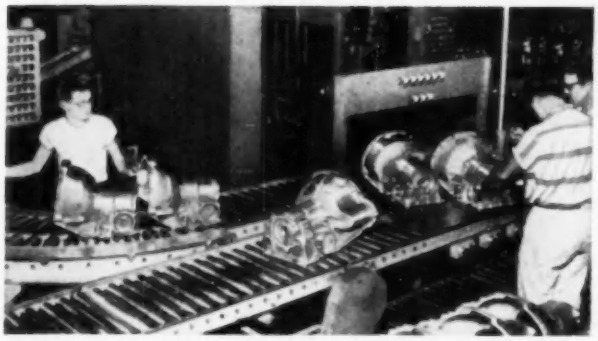
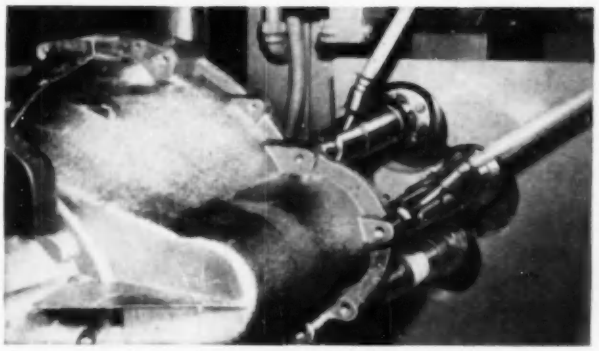
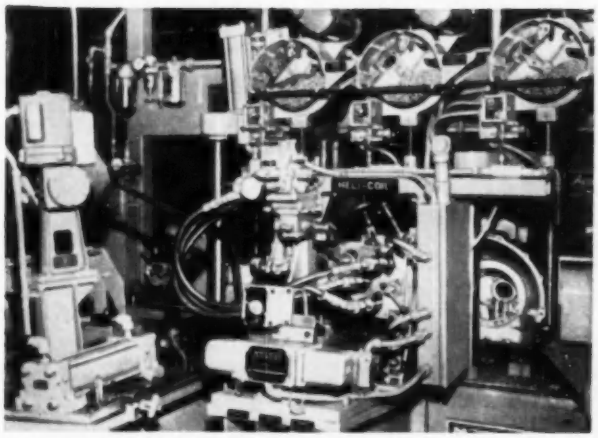
FORD Aluminum Transmission Housings get permanent steel thread strength with *HELI-COIL*® Screw-Thread Inserts



Aluminum housings are drilled and tapped, then transferred to *Heli-Coil* inserting machines on Ford assembly line. Each machine automatically and simultaneously installs three 5/16-18 Screw-Thread Inserts in seconds.



Inserts are picked up by air-powered rotating mandrels and wound into housing.



Hoppers over the inserting machine have 1500 insert capacity. Air jets speed inserts as they slide through nylon tubes into the inserting tools. Unit was specially designed and built by *Heli-Coil* Corporation as an integral part of the Ford production line and is the first completely automatic inserting machine to have all operations co-ordinated into a single unit.

Automatic inserting machines speed installation on production lines

Tapped threads in the starter mounting pad of this new Ford aluminum transmission housing would have been too soft to resist wear caused by vibration, impact and occasional dismantling for service.

Ford Motor Company uses one-piece *Heli-Coil* Screw-Thread Inserts for greater thread strength under dynamic and static loading. With these precision-formed steel wire threads, there's *no* chance of thread wear or stripping for the life of the transmission.

Heli-Coil engineers designed and built high-speed equipment to install the inserts *automatically* right on the transfer line. There's no production slowdown.

Heli-Coil Inserts

- allow repeated assembly and disassembly without loss of thread strength
- hold screws or studs securely under vibration and impact
- prevent thread wear, stripping, corrosion, galling and seizing
- can be used in standard proportion bosses without need for redesign
- are available in a complete range of U.N.C. and U.N.F. thread sizes as well as spark plug and pipe thread series
- save assembly time, space, weight and cost.

HELI-COIL CORPORATION
DANBURY, CONNECTICUT

HELI-COIL CORPORATION
3201 Shelter Rock Lane, Danbury, Conn.

Send complete design data on *Heli-Coil* Screw-Thread Inserts.

NAME_____ TITLE_____

FIRM_____

ADDRESS_____

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3048

IN CANADA: ARMSTRONG BEVERLEY ENGINEERING, Ltd.
6975 Jeanne Nanse St., Montreal 15, Que.

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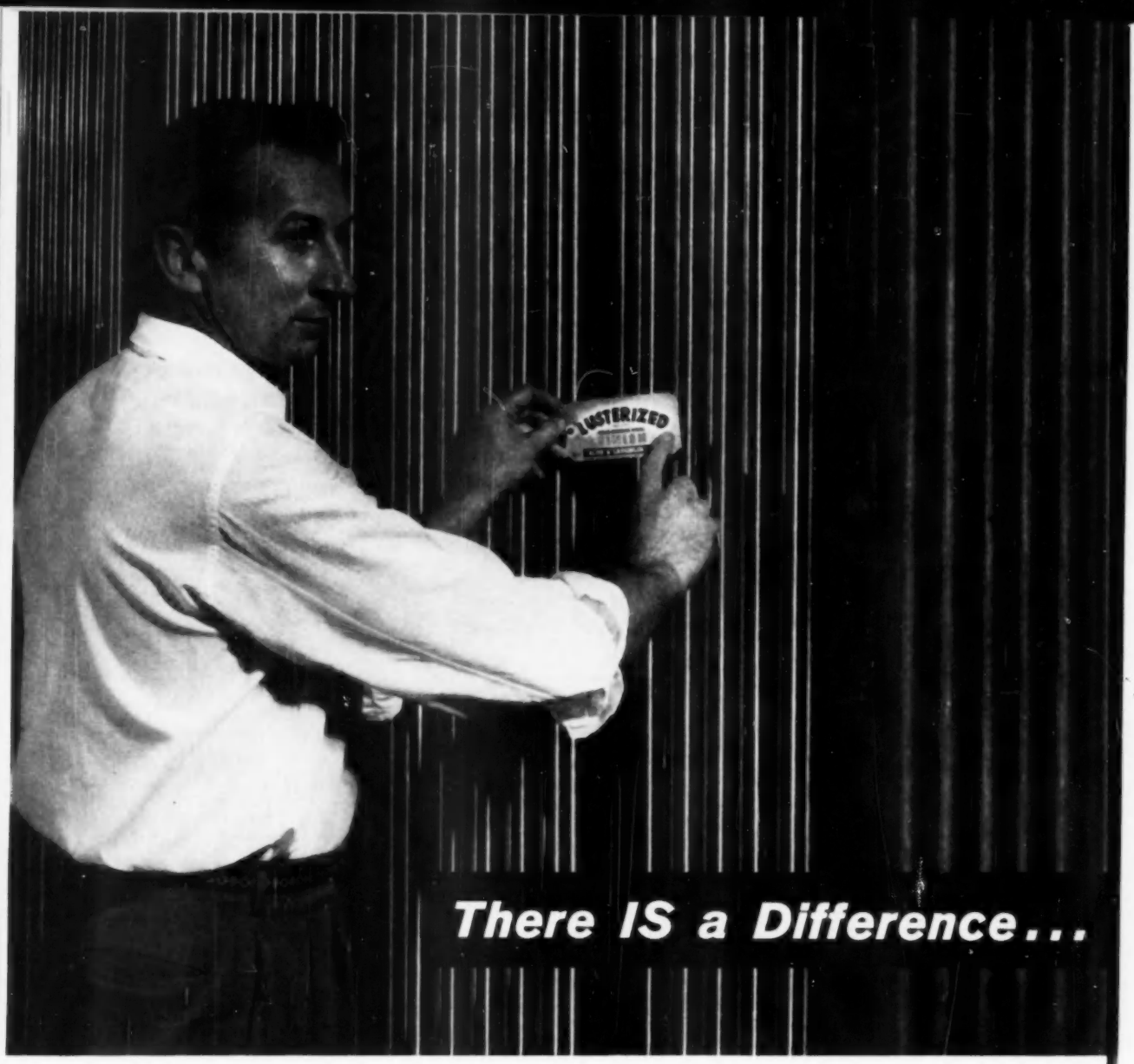

...a BIG DIFFERENCE in Cold Drawn Bars

Contrary to popular belief, all cold drawn bar steel is not alike. There is one big difference worthy of your specification—the Bliss & Laughlin difference.

Only B&L Lusterized® cold finished bars are different from all others. B&L bar steel is cleaner, brighter, easier to handle. The exclusive B&L cold finishing process (patent applied for) removes drawing oils, lime and processing grit, producing a smooth, gleaming bright surface without processing contaminants to slow your production. And B&L special protective oil keeps dirt, dust and other airborne contaminants from the Lusterized surface until you are ready to process the bars.

This big difference over other cold finished bar steel is another benefit developed from B&L research since 1891 to produce better cold finished bars.

You can see the difference. You can work the difference advantageously. Since you pay nothing extra for B&L Lusterized bars, it is always rewarding for you to specify "Bliss & Laughlin Lusterized."

Originators of LUSTERIZED® Finish—The BIG DIFFERENCE in Cold Drawn Bar Steel

BLISS & LAUGHLIN

GENERAL OFFICES: Harvey, Ill. • PLANTS: Harvey, Detroit, Buffalo, Mansfield, Mass.

Specialists in Finish, Accuracy, Straightness, Strength and Machinability

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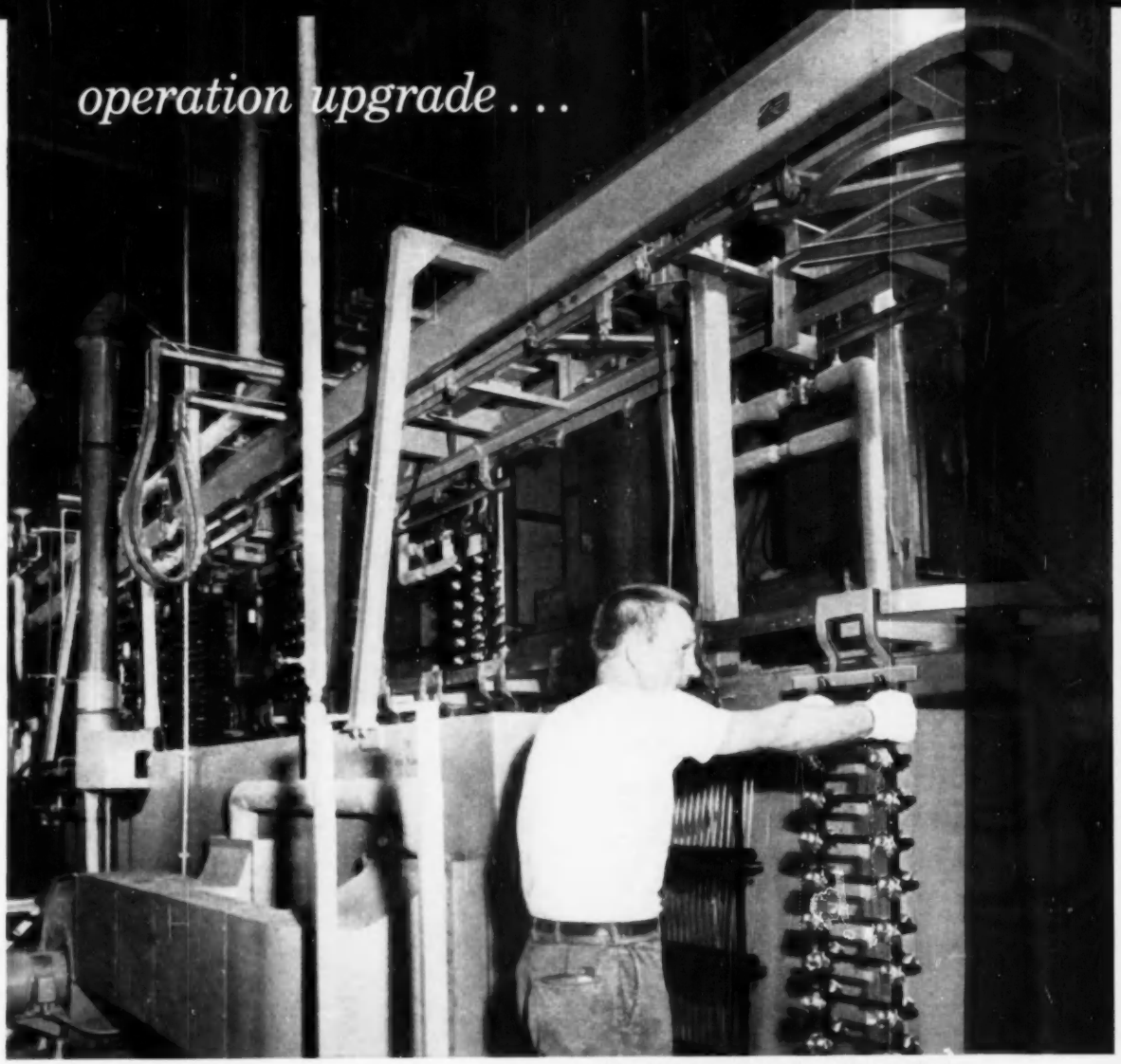
operation upgrade . . .



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This Udylite Cyclemaster, which is another way to say low cost automation, represents six important areas of improvement in American Standard's plating production.

- quality control to meet their most exacting top standards
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- almost total elimination of rejected pieces
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- Plastisol coated tanks for minimum maintenance . . . long life

Learn how Cyclemaster can perform with equally promising revisions of your profit picture while improving your product whatever it may be. To find out how so *much* can be accomplished for so *little*, ask your Udylite representative, today!

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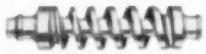

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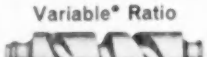

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● Wherever the job calls for alert, responsive, fatigueless steering . . . Ross *variable-ratio* steering is at its best!

Ross *variable-ratio* steering gives faster steering and quicker recovery for turns, and slower steering and greater stability for straight-ahead handling. Ross invites *your* inquiry.

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Now-28 ISOBRITE® PLATING BRIGHTENERS

For Zinc, Cadmium, Copper and White Brass

HAVE THE *FOUR* BIG FEATURES YOU ASKED FOR!

When the Allied line of brighteners, now known as ISOBRITE, had the famous ARP trademark on them, we made a survey to find out exactly what *you* wanted most in brighteners. Your answers helped guide our research and development staff in evaluating and consolidating our new line.

Now, here are the results—the industry's most complete line—28 *ISOBRITE Brighteners with these most-wanted features:*

1. LONGER LIFE

Your own records will show ISOBRITE Brighteners give longest possible life in rack or barrel plating operations.

2. BRIGHTNESS

You'll see for yourself that ISOBRITE Brighteners give a diamond-like sparkle that just can't be matched.

3. THROWING POWER

Even if your product has deep recesses, you'll get a uniform, all-over brightness that only ISOBRITE Brighteners can give you.

4. WIDER BRIGHT RANGE

ISOBRITE Brighteners operate efficiently over exceptionally wide current density ranges and have greater tolerance for temperature change.

Remember, there's an ISOBRITE Brightener especially designed for your specific operations—whether you're rack or barrel plating zinc, cadmium, copper or white brass . . . an ISOBRITE Brightener that is entirely compatible with most other brighteners. Don't just order brighteners—specify ISOBRITE. There *is* a difference!

Your Allied Finishing Systems Engineer will be glad to discuss the benefits of ISOBRITE Brighteners in your operations. He's listed in your 'phone book under "Plating Supplies." Or, write for technical data and product list giving details of your operations.

Allied Research Products, Inc.

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Branch Plant: 400 Midland Avenue, Detroit 3, Michigan
West Coast Licensee for Process Chemicals: L. H. Butcher Co.

Chemical and Electrochemical Processes, Anodes, Rectifiers, Equipment and Supplies for Metal Finishing

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"Toughest" inspection in the steel business assures you utmost uniformity in Timken® forging steels

You can always be sure your forged products made from Timken® steel forging bars will have uniform quality. One big reason is the rigid, 100% Final Inspection we give every bar. Examination is so thorough that our Inspection Department is known as the toughest in the steel business.

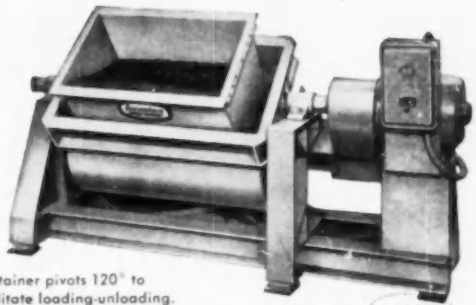
You save money, too, because of the uniform quality of Timken steel. It is remarkably uniform in structure, chemistry and dimension from heat to heat, bar to bar, order to order. And because we handle each order individually, we can target our procedures to *your* end-use requirements. You don't have to interrupt your operations to make costly equipment adjustments.

Important to our operations is a new Metallurgical Research Center, one of industry's most modern. Its facilities range all the way from an experimental melting laboratory to one of the industry's finest technical libraries. It is designed not only to improve our own products but also to solve customer problems—your problems.

When you buy Timken steel you get: 1) *Quality that's uniform from heat to heat, bar to bar, order to order.* 2) *Service from the experts in specialty steels.* 3) *Over 40 years experience in solving tough steel problems.*

For the most from your modern forging operations, specify Timken steel forging bars. The Timken Roller Bearing Company, Steel and Tube Division, Canton 6, Ohio. Cable: "TIMROSCO". *Makers of Tapered Roller Bearings, Fine Alloy Steels and Removable Rock Bits.*

TIMKEN ALLOY STEEL AND SEAMLESS TUBING ARE AVAILABLE FROM WAREHOUSE STOCKS IN 44 CITIES IN THE UNITED STATES



Container pivots 120° to facilitate loading-unloading.

ALMCO *Vibrasheen* FINISHES FASTER!

Constant vibratory motion . . . that's the secret of faster deburring and finishing you now get by using the new ALMCO *Vibrasheen* Method!

This amazing metal finishing machine vibrates a full 5 cu. ft. load* of parts and media . . . uses scrubbing action to remove burrs and finish parts in a fraction of the time required in ordinary barrel finishing operations.

The new *Vibrasheen* Method is particularly suited for faster burr removal from parts, and finishing hard-to-reach internal crevices. Can be used for deburring, descaling, cleaning, burnishing and surface refinement.

For full story on *Vibrasheen* Method and on processing sample parts, write for the new ALMCO Album of New Products!

* *Smaller and larger models also available.*

FREE!
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Gives full information on new Almco Supersheen Systems. Describes new and better machines, methods and media. Write today!

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CONTINENTAL RED SEAL POWER

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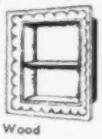
ADD BEAUTY, COLOR, SALES APPEAL

WITH *Cellusuede Flock*
THE PRODUCT FINISH WITH 1000 USES



Every day product designers, industrial finish and material engineers are finding new, profitable uses for Cellusuede Flock — industry's most versatile product coating. With these cotton, rayon or acetate fibers, you can add new beauty, color, and sales appeal to your product, provide a durable protective finish, silence noises, or dampen vibration. Best of all, the soft velvet-like Cellusuede finish is easy to apply to wood, metal, plastic, fabrics, leather, cardboard, or paper surfaces, either on a modified or production line basis. It's inexpensive, more durable than fabric, and readily available in a wide range of textures and beautiful colors. Investigate today the profit possibility of using Cellusuede for your product.

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Producers of Natural and Synthetic Flock
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(to 900 Foot pounds)

both from one
STURTEVANT
TORQUE WRENCH

Now you can do high torque work with a Sturtevant Torque Wrench of normal capacity range—small in size—light in weight—with fine increment markings and moderately priced.

With a new Multi-range, Multi-purpose Adapter you can step up the capacity of your Torque Wrench to a new high range and you can plug in any drive end you want . . . Box wrench, ratchet, drive square for sockets.

All drive end accessories are interchangeable and stock items.

In this way each Sturtevant Torque Wrench effectively equals two complete sets of ordinary single purpose Torque tools.

WIDE CHOICE OF INTERCHANGEABLE DRIVERS

Only Torque wrenches with the Sturtevant patented pivoted handle can be accurate with adapters.

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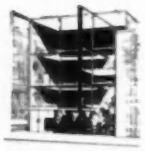
A CHILTON  PUBLICATION

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Advertisers' Products and Services Data; and more Information on New Production Equipment and New Products described editorially in this issue

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Radiography Equipment 1

A new brochure describes, in chart style, 17 gamma radiography machines. This literature covers such specifications as: type (panoramic or beam), cone, mount, capacity and weight. One of the portable machines, in this AEC accepted line, is shown making a panoramic exposure. *Radiation Engineered Services.*

Metal Washing Operations 2

A booklet describes system components, operating principles, advantages and other applications of an electronic conductivity controller. *Electro Mechanisms Corp.*

Machining Plastics 3

Precision machining of plastic sheets, rods and tubes for the automotive, aviation, electrical and electronic industries and equipment is described and illustrated in four pages. *Insulating Fabricators, Inc.*

Blast Cleaning Steel 4

Factors to be considered in the selection of steel blast cleaning abrasives are outlined in a new 20 page booklet. Illustrations and graphs show some quality control tests. *Pangborn Corp.*

Bonding Agents 5

A new bulletin containing selector charts for potting compounds, coatings, foams and bonding agents, has been designed to assist the design engineer, electronic engineer and packaging specialist in choosing the exact resin to best suit his particular needs. *Plastic Associates.*

Blowing Foams 6

Blowing urethane foams with fluorinated hydrocarbons is covered in a four page booklet that has a chart showing eight types of foams along with other materials. This chart gives data on the specifications of these foams. *Pennsalt Chemicals.*

Shaft Seals 7

This folder shows cutaway views of mechanical shaft seals for water pumps and includes prints and data covering space requirements and applications. *Muskegon Piston Ring Co.*

Machine Catalog 8

A new 16 page, two color, illustrated catalog describes basic design features and specifications of all machines manufactured by the *Heald Machine Co.*

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New Catalogues, Bulletins, Data Sheets and Reports

Advertisers' Products and Services Data; and more information on New Production Equipment and New Products described editorially in this Issue

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Cryogenic Fluids 9

A folding pocket card presents, in tabular form, the physical property equivalents of some cryogenic fluids. This card gives boiling and melting points, critical temperatures and pressures, volume, mass and thermal equivalents. *Linde Co., Div. of Union Carbide.*

Control Catalog 10

A new publication contains complete data concerning general purpose control devices. This 72 page catalog has numerous horsepower selection charts and product information on motor starters, contactors, relays, solenoids, limit switches, push buttons, static control and pilot devices. *General Electric Co.*

Rolling Steel Doors 11

This 16-page publication details features and engineering specifications of standard hand mechanical and power operated industrial steel doors. Also discussed are special needs and applications. *The R. C. Mahon Co.*

Turbofan Engine 12

Bulletin GED-3986 describes in detail design advantages, performance characteristics, installation, maintenance and operating data of this small, aft fan engine. It is 16 pages long and also covers specific fuel consumption, range, fuel cost and take off distance. *General Electric Co.*

Overhead Load Handling 13

Covering more than 20 types of cranes, hoists and specialty items this illustrated catalog is said to contain equipment to meet virtually any requirement in load handling encountered in industry. *Harrington Co.*

Electronic Instruments 14

Schematic diagrams, application circuits, specification charts and graphs are described in a 32-page reference catalog for 1960 items. Please request on company letterhead from *Keithley Instruments, Inc.*, 12415 Euclid Ave., Cleveland 6, Ohio.

Metering Pumps 15

A new line of pumps are covered in an 11 page catalog that gives a short description of this line. There are many illustrations, dimension drawings and general information items along with a capacity-pressure "selection" chart that lists all the statistical data. *Wallace and Tiernan Inc.*

Switch Data 16

Catalog 77b includes 16 pages of facts on a variety of switches. Data on variations in mounting, actuators, electrical ratings, operating characteristics and contact arrangements for aircraft switching requirements. *Micro Switch, a Div. of Minneapolis-Honeywell Regulator Co.*

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Tool Holders 17

A complete line of tool holders are cataloged in a four page bulletin. This line consists of three standard types with 51 individual models; general purpose, tap holder and threaded adjustable. *Burgmaster Corp.*

Gear Presses 18

A twelve-page bulletin, in color, illustrates and describes a line of two and four point eccentric gear presses in capacities from 100 to 1500 tons. *The Federal Machine and Welder Co.*

Magnetic Modulators 19

A six page brochure contains a twelve part chart describing fifteen operating characteristics of six modulators. There are also graphs and illustrations in this material. *General Magnetics, Inc.*

Temperature Ovens 20

A four page, two color brochure covering high temperature ovens contains nine illustrations and six charts. It is designed to help in the selection of industrial oven requirements. *Blue M Electric Co.*

High Speed Presses 21

Featured in this brochure is a press production chart designed to help the production engineer and plant manager increase quality and production. *Cleveland Punch and Shear Works Co.*

Switches and Relays 22

Typical applications, actual size illustrations and technical information are featured in a new 1960 catalog covering switches, relays and gravity sensing potentiometers. *Hamlin Inc.*

Aluminum Coating 23

A new brochure on hot dip aluminum coating processes to prevent atmospheric corrosion and high temperature oxidation and scaling of ferrous parts. *Arthur Tickle Engineering Works, Inc.*

Drill Presses 24

A new six page illustrated bulletin, describing a new line of 15 in. drill presses is now available from the *Rockwell Mfg. Co.*

Punch Presses 25

An illustrated four page bulletin describes five punch presses that are offered in deep throat design. Other features of this line include varied speeds, wide range shut heights and special design for multiple production operations. *Kenco Mfg. Co.*

Automated Profiling 26

A nine part specification list is shown in this booklet covering an electro-hydraulic series, 360 deg, automatic tracer. Some of the parts described are feed, control, deflection meter and many other features. *George Gorton Machine Co.*

Hermatic Sealing 27

Specialized precision alloys, developed for sealing metal to glass, are described in a four page booklet. It contains charts and a graph showing expansion-mils per inch and temperature in deg. C. *Wilbur B. Driver Co.*

Temperature Crayons 28

A revised brochure lists the 80 ratings of Tempilstiks® and Tempilaq®, ranging from 113 to 2500 deg. F. in systematically spaced intervals. This material also contains a Fahrenheit and Centigrade equivalents table. *Tempil® Corp.*

Automatic Profiler 29

An eight page bulletin lists all the specifications of the MagneTRACE with a list of optional equipment. This material is also fully illustrated and contains typical application information. *Pratt and Whitney Co., Inc.*

Circuit Breakers 30

An illustrated, two color, 40 page, bulletin gives ratings, specifications and operating characteristics of this line as a guide to selection for designers, contractors and engineering consultants. *I-T-E Circuit Breaker Co.*

Tube Forming 31

An engineering bulletin describes in eight illustrated pages the cold process method of tube bending. *Aeroquip Corp.*

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Removable Punches 32

A new and different concept of retainers with punches that can be pushed by hand into the retainer and removed with a pulling wrench while still in the press is described in a six page catalog. Operation of these retainers is covered, along with prices, in this literature. *Pivot Punch and Die Corp.*

Plasma Jet Coatings 33

Six illustrated pages describe plasma jet coatings, metal and ceramic spraying and other hard facing services that are employed in industry. *Cleveland Hard Facing, Inc.*

Press Brake Bulletin 34

Press brakes, 90 through 1500 tons, are presented in a new 28 page illustrated bulletin. Tables for computing bending, punching and blanking, specifications and general information are also included. *Niagara Machine and Tool Works.*

Distribution Equipment 35

Bulletin GEA-6981 describes in 12 pages the features, installation and application of pad-mounted transformers and semi-buried transformers. Also included are illustrations, circuit diagrams and dimentional diagrams. *General Electric Co.*

Bus Duct Booklet 36

Features, illustrations and applications are described in a booklet entitled "High Frequency Bus Duct." It contains a curve of voltage drop at 400 cycles per second plotted against load. *Westinghouse Electric Corp.*

Flame Cutting Machine 37

A catalog discusses in detail the design, construction and operation of the Linagraph. This machine is suitable for straight and design cutting on steel plate up to eight feet long. *The Air Reduction Sales Co.*

High Vacuum Pumps 38

A new leaflet describes the series 150 electronic pumps together with corresponding power supply. This line of pumps are available under the trade name of UlteVac. *Ultek Corp.*

Thermocouples 39

Mineral insulated thermocouples are described in 18 pages of a new catalog. It covers specifications, endurance, size and many other qualifications. *Conax Corp.*

Weld Guide 40

Designer's guide for welded construction has been revised to include the latest standard American Weld Society symbols. Other basic information on welding is also given. *The Lincoln Electric Co.*

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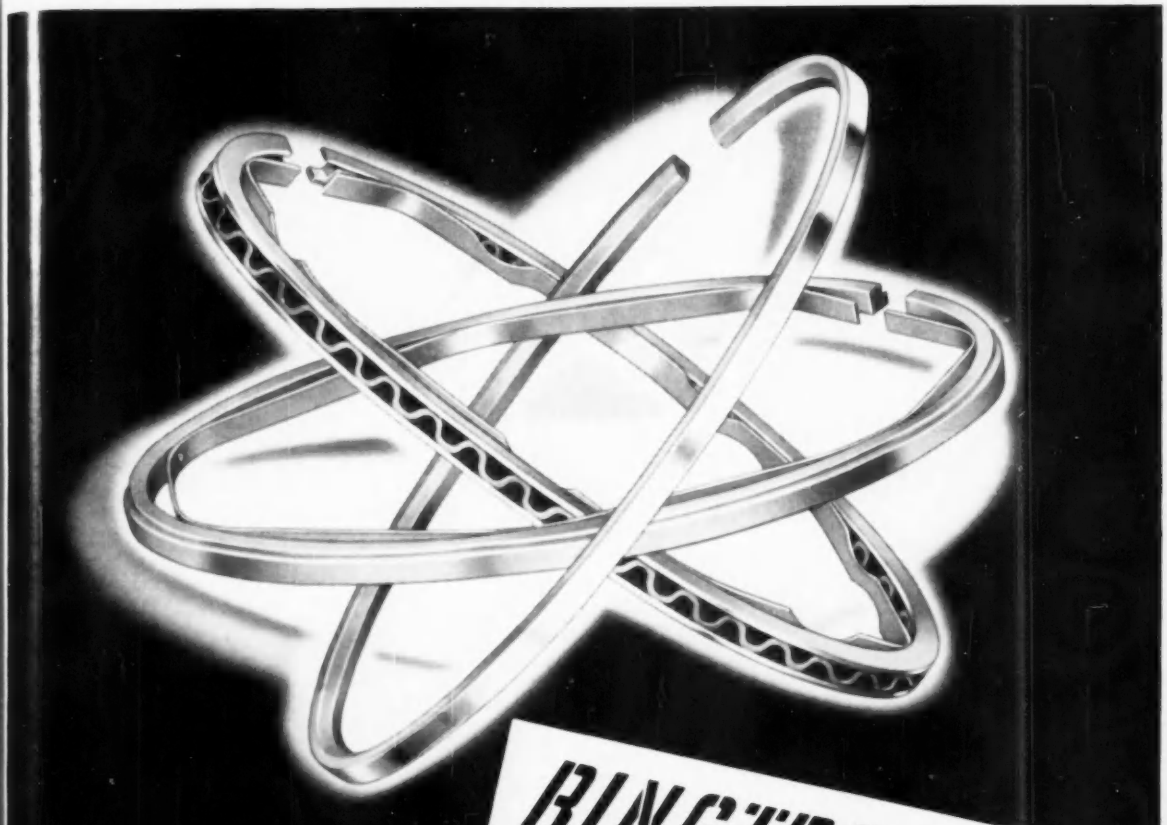

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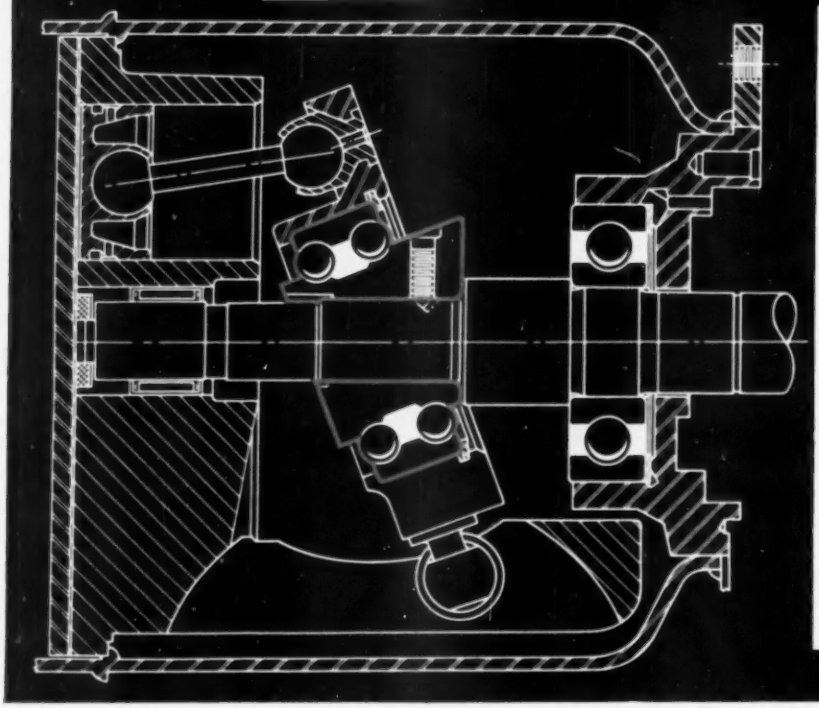

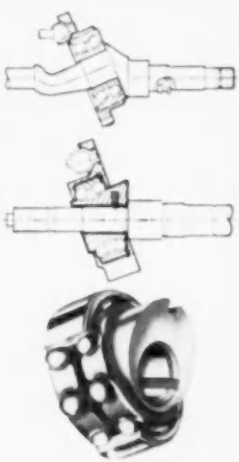

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